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FINAL SITE SPECIFIC WORK PLAN ADDENDUM FOR INTRUSIVE INVESTIGATION AT THE  
SITE UXO 06 BORROW PIT EXPANSION AREA MCB CAMP LEJEUNE NC

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CH2M HILL

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Final

**Site Specific Work Plan Addendum for  
Intrusive Investigation at the  
Site UXO-06 Borrow Pit Expansion Area**

**Marine Corps Base Camp Lejeune  
Jacksonville, North Carolina**

Task Order 009

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Prepared for

**Department of the Navy  
Naval Facilities Engineering Command  
Mid-Atlantic**

Under the

**Multi-Media  
Contract N62470-07-D-0501**

Prepared by



**CH2MHILL**

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# Acronyms and Abbreviations

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BIP	blow-in-place
CLEAN	Comprehensive Long-Term Environmental Action Navy
CTO	Contract Task Order
CWM	Chemical Warfare Materiel
DDESB	Department of Defense Explosives Safety Board
DFOW	definable feature of work
DGM	digital geophysical mapping
DMM	discarded military munitions
DoD	Department of Defense
EOD	Explosive Ordnance Disposal
ESQD	explosives safety quantity-distance
ESS	Explosives Safety Submission
EZ	exclusion zone
ft	foot or feet
FTL	field team leader
GPS	global positioning system
H&S	health and safety
HD	hazard division
HSP	Health and Safety Plan
IBD	inhabited building distance
m	meter
MARCORSYSCOM	Marine Corps Systems Command
MCB	Marine Corps Base
MD	munitions debris
MEC	munitions and explosives of concern
MGFD	munition with greatest fragmentation distance
MPPEH	material potentially presenting an explosive hazard
MRP	Munitions Response Program
MRS	munitions response site
MSD	minimum separation distance
NAVFAC	Naval Facilities Engineering Command, Mid-Atlantic
NCDENR	North Carolina Department of Environment and Natural Resources
NOSSA	Naval Ordnance Safety & Security Activity
ORR	Operations Readiness Review
PA/SI	Preliminary Assessment/Site Inspection
PM	Project Manager

PTR	public transportation route
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
QCP	Quality Control Plan
RTK	real-time kinematics
SUXOS	Senior Unexploded Ordnance Supervisor
TNT	trinitrotoluene
TO	task order
TP	Technical Paper
TSD	team separation distance
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
UXO	unexploded ordnance
UXOQCS	Unexploded Ordnance Quality Control Specialist
WP	Work Plan

# Introduction

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## 1.1 Background and Project Objectives

Marine Corps Base (MCB) Camp Lejeune is conducting a munitions response program (MRP) Preliminary Assessment/Site Inspection (PA/SI) at the unexploded ordnance (UXO) site UXO-06, Former Fortified Beach Assault Area under the Comprehensive Long-Term Environmental Action Navy (CLEAN) III Program Contract N62470-02-D-3052, Contract Task Order (CTO)-168. The PA/SI activities include performing an environmental investigation and digital geophysical mapping (DGM) of the UXO-06 site borrow pit expansion area.

This Work Plan (WP) describes intrusive investigation activities that will be performed to evaluate the potential presence of munitions and explosives of concern (MEC) at a planned borrow pit expansion area within Site UXO-06. The intrusive investigation will be based on the CTO-168 DGM results. The intrusive investigation activities described in this WP are being performed under the Multi-Media Contract N62470-07-D-0501, Task Order (TO)-009.

## 1.2 Work Plan Scope and Organization

The following intrusive investigation activities will be performed in accordance with methods and procedures detailed in the MCB Camp Lejeune MRP Master Project Plans (CH2M HILL, 2007a) (referred to herein as the MRP Master Project Plans):

- Reacquire all geophysical anomalies that were selected as potentially representing subsurface MEC
- Execute manual digging and identification of sources of anomalies
- Perform demilitarization of all MEC and material potentially presenting an explosive hazard (MPPEH) identified during the intrusive activity
- Perform removal verification and excavation backfilling
- Prepare an After Action Report documenting the MEC intrusive investigation

This WP is divided into sections providing information on the detailed approach including procedures to be employed during the execution of the project. Appendices to the WP provide supporting documentation that details specific procedures for the execution of the project.

This WP is organized as follows:

- **Section 1, Introduction**, provides general information about this WP, describes the UXO-06 Former Fortified Beach Assault Area, summarizes the history of the site, and presents the project scope and objectives.

- **Section 2, Technical Management Plan**, identifies the technical approach, methods, and operational procedures that will be used to execute the PA/SI support project.
- **Section 3, MEC Intrusive Investigation Plan**, identifies the technical approach, methods, and operational procedures that will be used to execute the MEC intrusive investigation including disposal of non-MEC and non-MPPEH anomaly source material, and blow-in-place (BIP) demolition of MEC and MPPEH (if required).
- **Section 4, Explosives Management Plan**, provides details for management of explosives in accordance with applicable regulations.
- **Section 5, Explosives Siting Plan**, provides explosives safety criteria for planning and siting explosives operations.
- **Section 6, Quality Control Plan (QCP)**, provides details of the approach, methods, and operational procedures to be employed for quality control (QC) of the PA/SI support activities at the UXO-06 site.
- **Section 7, Environmental Protection Plan**, describes the approach, methods, and operational procedures to be employed to protect the natural environment during the performance of all tasks at the UXO-06 site.
- **Section 8, References**, lists the references cited in the preceding sections.
- **Appendix A, Health and Safety Plan (HSP)**, provides an interface with CH2M HILL's overall health and safety program. The HSP also includes the MEC avoidance procedures that will be used to ensure that onsite personnel are protected from MEC that may be present at the site.
- **Appendix B, MEC Removal Standard Operating Procedures**, provides standard operating procedures detailing MEC removal procedures.

An Explosives Safety Submission (ESS) is being submitted to Marine Corps System Command (MARCORSYSCOM) under separate cover for review and approval. The ESS was prepared in support of MEC investigation and removal activities to be performed at the project site. The ESS will be reviewed and approved by MARCORSYSCOM, Naval Ordnance Safety and Security Activity (NOSSA), and Department of Defense Explosives Safety Board (DDESB) for conformance with all applicable Marine Corps, Department of the Navy, and Department of Defense requirements for the safe handling of MEC and explosives. The ESS will be approved by these agencies prior to the start of the intrusive investigation activities.

## 1.3 Site Location and Description

Site UXO-06, also referred to in the Range Identification and Preliminary Assessment (USACE, 2001) as Range D-27, is approximately 177 acres in size and is crossed by Gonzales Boulevard. The site is located west of Sneads Ferry Road and south of Main Service Road. This anomaly investigation includes the areas of Site UXO-06 where DGM was performed during the CLEAN III Program Contract N62470-02-D-3052 CTO-168 investigation (**Figure 1-1**). This area includes the portions of UXO-06 that have not been previously

investigated. Based on site reconnaissance, it is assumed that approximately 50 percent of Site UXO-06 is heavily wooded with dense undergrowth. Several buildings/parking lots are located north of Gonzales Boulevard and one building/parking lot is south of Gonzales Boulevard. A portion of the site is used as a borrow pit from which soil is used for construction projects across the Base. Also present at Site UXO-06 are several surface water sources. The topography of Site UXO-06 is relatively flat except for the borrow pit area where the topographic relief is approximately 40 feet (ft). A Focused SI was previously conducted at a 4.4-acre area located within UXO-06 boundary for the Armory MILCON project. The Armory MILCON area is not included in the area addressed by this WP.

## 1.4 Site History

The Range Identification and Preliminary Assessment (USACE, 2001) reported that this former 177-acre range was in use from 1953 until approximately 1977, and listed the following types of munitions as having been authorized for use at this range:

- Blank small arms
- Demolitions (½-pound blocks)
- 3.5-inch rocket, practice
- Rifle grenade, practice
- Hand grenade, smoke

The Range Identification and Preliminary Assessment also listed the white phosphorus hand grenade as a munition that was authorized for firing at this site. However, interviews with former base personnel (Redmond, 2007) indicated that it is highly unlikely that white phosphorus grenades would have been used in beach assault training, and no grenades were found during range clearance activities conducted at this site in the period 1980 to 1983. Furthermore, no grenade fragments were found on the ground surface during the 2006 SI. Therefore, the hand grenade will not be furthered considered as a potential MEC item at this site.

In addition, cleaning solvents/solutions were used at the site to clean equipment. No chemical warfare materiel (CWM) is expected. Disposal of munitions and/or burial of munitions is not reported or suspected. The area is primarily undeveloped with access restricted to military personnel. The general public is precluded from entry to the area.

A detailed investigative review of existing information about UXO-06 and interviews with site personnel was conducted by CH2M HILL in May 2007 as part of the CTO-168 investigation. Information obtain by this effort is in the Archival Records Search Report presented in **Appendix A** of the draft *Site-Specific Work Plan Addendum for Preliminary Assessment/Site Inspection Site UXO-06 Former Fortified Beach Assault Area* (CH2M HILL, 2007b).

The Focused SI conducted at the Armory area (located within the UXO-06 site, but not included in the area addressed by this WP) in 2006 and the results were documented in a Focused SI Report (CH2M HILL, 2007). The objectives of the focused SI were to:

- Identify the presence and nature of any environmental contamination that may exist in the munitions response site (MRS) by conducting an investigation of groundwater and soil in and immediately surrounding the 4.4-acre MRS.
- Estimate the number and density of geophysical anomalies that may represent subsurface MEC by conducting DGM across the MRS.

During the intrusive investigation performed within the Armory area of UXO-06 in January and February 2008, the following munitions were recovered:

- M29 series 3.5-inch Practice Rocket
- M18 Colored Smoke Hand Grenade with M201A1 Fuse
- MK13 MOD-0 Marine Hand Signal Flare

## 1.5 Climate

The climate in the MCB Camp Lejeune area is discussed in **Section 1.4** of the MRP Master Project Plans (CH2M HILL, 2007a).

## 1.6 Geology and Hydrogeology

The regional geology and hydrogeology at MCB Camp Lejeune is discussed in **Section 1.6 and 1.7** of the MRP Master Project Plans. Site-specific geologic and hydrogeologic data is not available for this site, but will be collected during the PA/SI and presented in the PA/SI Report being conducted under CTO-168.

# Technical Management Plan

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## 2.1 Guidance, Regulations, and Policies

The MR intrusive investigation at UXO-06 will be conducted under the guidance documents, regulations, and polices described in **Section 2.1** of the MRP Master Project Plans.

## 2.2 MEC Contingency Procedures

Based on the documented history of Department of Defense (DoD) activities at UXO-06, it is anticipated that if MEC is discovered it can be destroyed onsite. Therefore, alternatives to onsite disposal are not identified in this WP. Likewise, the discovery of unidentified MEC is not anticipated. If any MEC items are discovered that cannot be identified, MEC contingency procedures will be conducted in accordance with **Section 2.2** of the MRP Master Project Plans.

## 2.3 Chemical Warfare Materiel Contingency Procedures

Based on the documented history of DoD activities at UXO-06, it is not anticipated that CWM will be discovered. If CWM is encountered, all work will immediately cease and CWM contingency procedures will be conducted in accordance to **Section 2.3** of the MRP Master Project Plans.

## 2.4 Project Organization, Personnel, Reporting, and Schedule

### 2.4.1 Project Organization

The key organizations involved in this project are Naval Facilities Engineering Command (NAVFAC), MCB Camp Lejeune, the North Carolina Department of Environment and Natural Resources (NCDENR), the United States Environmental Protection Agency (USEPA) and CH2M HILL. Project execution will be conducted by CH2M HILL and its subcontractors; specific duties for CH2M HILL and its subcontractors are described in **Section 2.4** of the MRP Master Project Plans. CH2M HILL will issue a subcontract for MEC support.

### 2.4.2 Project Personnel

The reporting relationship between key project personnel and the roles and responsibilities of the key personnel are discussed in **Section 2.4** of the MRP Master Project Plans. Contact information for key project personnel is shown in **Table 2-1**.

### 2.4.3 Project Schedule

Figure 2-1 presents a detailed project schedule, including key milestones.

## 2.5 Technical Approach

### 2.5.1 Task 1—Project Planning

This task includes project management, meetings, WP preparation, and subcontractor procurement.

Project management includes all work necessary for controlling the project budget and schedule. This includes monthly status reports and invoicing, as well as all other administrative tasks needed for project performance.

Meetings are planned throughout the course of this project. The meetings will be held to discuss proposed work, present investigation findings, and discuss project status. The meetings are planned to be held at MCB Camp Lejeune, CH2M HILL's Charlotte office, or at other locations as necessary.

Subcontractor procurement is also included under this task. Anticipated subcontractor services include MEC support.

### 2.5.2 Task 2—Data Evaluation/Archive Review

An archival records search was performed during preparation of the draft *Site-Specific Work Plan Addendum for Preliminary Assessment/Site Inspection Site UXO-06 Former Fortified Beach Assault Area* (CH2M HILL, 2007b) to identify previous site activities that may have environmentally impacted the investigation area. The results are presented in **Appendix A** of the draft *Site-Specific Work Plan Addendum for Preliminary Assessment/Site Inspection Site UXO-06 Former Fortified Beach Assault Area* (CH2M HILL, 2007b).

### 2.5.3 Task 3—MEC Intrusive Investigation

A MEC intrusive investigation will be conducted to investigate geophysical anomalies identified during the CTO-168 site activities. The primary intrusive investigation activities are the following:

- Site Preparation
- Anomaly reacquisition/detection
- Manual excavation
- Anomaly identification and verification
- MEC/MPPEH demolition
- Scrap disposal

### 2.5.4 Task 4—Reporting

An After Action Report will be prepared, in accordance with NOSSA instruction document 8020.15A (NOSSA, 2002) to document the results of the MEC intrusive investigation. The report will provide a summary of all MEC found during the investigation, summarize all the MEC removal activities, and provide an evaluation of the selected removal methods and

relative effectiveness. Prior to submittal of the final report, a preliminary draft will be provided in electronic format to MARCORPSYSCOM and NOSSA.

# MEC Intrusive Investigation Plan

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Based on the results of the DGM survey performed under the CTO-168 project, a MEC intrusive investigation of selected geophysical anomalies will be conducted to evaluate the nature and density of MEC that may be present at UXO-06. The equipment, approach, methods, operation procedures and quality control to be used during the MEC intrusive investigation are detailed below.

## 3.1 Planning

The following actions require advanced planning and will be conducted prior to mobilization:

- Finalize procurement actions for items and services needed during the mobilization.
- Hold a pre-mobilization meeting and Operations Readiness Review (ORR) with the project team.
- Coordinate with NAVFAC project manager (PM) and Base Point of Contact on notification to local stakeholders of upcoming project activities.
- Reconfirm site personnel documentation of proper training, certifications, and medical monitoring.
- Coordinate with the MCB Camp Lejeune Explosive Ordnance Disposal (EOD) for potential emergency support for MEC identification and disposal.

## 3.2 Site Preparation

The following subsections describe the procedures associated with site preparation, including mobilization of personnel and equipment and the activities required to prepare the site for intrusive activities.

### Mobilization

A mobilization period will include identifying, briefing, and mobilizing staff and securing and deploying equipment. Mobilization activities include general activities, establishing a command post, and a kickoff and safety meeting.

### General Activities

- Identify/procure, package, ship, and inventory project equipment, including geophysical detection equipment, hand tools and supplies, portable toilets, and any other miscellaneous supplies.

- Coordinate with local agencies, including police, hospital, and fire department, as appropriate.
- Coordinate communications with MCB Camp Lejeune EOD and other logistical support.
- Finalize operating schedules.
- Establish munitions debris (MD)/non-MEC scrap storage area.
- Organize support facilities and test communication equipment.
- Test and inspect equipment.
- Assemble and transport the work force.
- Conduct site-specific training on the WP, HSP, and MEC procedures and hazards.
- Verify that all forms and project documentation are in order and project team members understand their responsibilities with regard to completion of project reporting requirements.

#### **Command Post**

- A project command post will be established in an area that is convenient to intrusive activities, but outside the exclusion zones (EZs) that will be established for intrusive activities.
- A field office equipped with power and communications will be established at the command post. The field office will be the central point of communications for the project and the command location for direction and coordination of intrusive activities at UXO-06. Personnel will report to this building at the beginning of each workday for the daily health and safety (H&S) briefing. Site documents, including H&S records, will also be maintained in the field office.
- Sanitary facilities will be located at the command post.
- Lockable storage will be provided, either in the field office or in storage trailers, for portable field equipment.

#### **Kickoff/Safety Meeting**

During mobilization, a kickoff and site safety meeting will be conducted. This meeting will include a review of this WP and review and acknowledgment of the HSP by all site personnel. Additional meetings will occur as needed, as new personnel, visitors, and/or subcontractors arrive at the site.

### **3.3 MEC Removal Operations**

Anomaly reacquisition/intrusive investigation is the only MEC removal technique anticipated to be employed during the MEC intrusive investigation at UXO-06. This operation will be performed using hand excavation procedures to identify the source of individual anomalies following reacquisition operations.

### 3.3.1 Anomaly Reacquisition/Intrusive Investigation

All geophysical anomalies identified for excavation will be reacquired by an intrusive investigation team, composed of UXO technicians, to an exact location using real-time kinematics (RTK) global positioning system (GPS) and handheld magnetometer. After locating the approximate anomaly position with the GPS, the magnetometer will be used to confirm the exact position of the anomaly. If the anomaly is not immediately intrusively investigated, the location will be flagged using a polyvinyl chloride (PVC) flag with the unique identifier number recorded in indelible ink. The location will be flagged one ft north of the actual field location of each reacquired anomaly shown on the tracking sheet.

Excavation of individual geophysical anomalies will be performed by qualified UXO technicians using hand-excavation tools. The UXO teams performing this work will be composed of at least one UXO Technician II and up to four UXO Technicians II or I supervised by a Technician III. Details associated with this operation are included in **Appendix B**, MEC Removal Standard Operating Procedures, of this WP. The Standard Operating Procedures will be provided by the subcontractor once procured.

Small hand tools, such as shovels, spades, trowels, and pry bars, will be used to access potential MEC/MPPEH. Hand tools will be used for the majority of the items, which generally are expected to be found near the surface. The following basic technique will be used for anomaly excavation:

#### MEC Removal Standard Operating Procedures

- The UXO technician will investigate within a 1 meter (m) radius of the flagged anomaly with an appropriate geophysical instrument.
- Until identified otherwise, the anomaly is assumed to be MEC. Excavation will be initiated adjacent to the subsurface anomaly. The excavation will continue until the excavated area has reached a depth below the top of the anomaly as determined by frequent inspection with an appropriate geophysical instrument.
- Using progressively smaller and more delicate tools to remove the soil carefully, the excavation team will expand the sidewall to expose the metallic item for inspection and identification without moving or disturbing the item.
- Once the item is exposed for inspection, the excavation team will determine if it is MEC.
- If the item is MEC, it will be handled as discussed in **Section 3.6**.
- If the item is not MEC, it will be removed and the area will be rechecked with an EM-61 to ensure that a MEC item was not hidden beneath the removed item. The excavation team will then annotate the results of the excavation on the dig sheet and move on to the next marked geophysical anomaly.

## 3.4 Removal Verification

The following is the procedure to be followed for QC inspections of the intrusive investigation:

- After the dig team intrusively investigates an anomaly location, the hole is to be left open to the depth investigated and the PVC flag placed in the hole or bent after the investigation is completed.
- The UXO QC Specialist (UXOQCS) will inspect at least 10 percent of the intrusively investigated anomaly locations using an EM-61 geophysical instrument to determine whether all detectable metallic items within a two-foot radius of the hole to a depth of two feet have been removed. The locations checked will be distributed in a spatially representative sample across each grid.
- All holes related to intrusive investigations will be filled back to original grade or covered before departing the project site each day.
- Anomaly locations inspected, along with results of the inspection and corrective actions planned in the event that the UXOQCS determines that inspection results require a change in intrusive team procedures or a re-performance of any work, will be documented by the UXO subcontractor and provided to the CH2M HILL geophysicist.
- Additional QC analysis of intrusive results vs. original amplitude of geophysical anomalies will be performed by the CH2M HILL Project Geophysicist. Anomaly locations that are determined to need re-investigation through this process will be re-inspected.

### 3.5 Demobilization

Full demobilization will occur when the project is completed and appropriate quality assurance (QA)/QC checks have been performed. Personnel who are no longer needed during the course of field operations may be demobilized prior to the final project completion date. The following will occur prior to demobilization:

- All areas to be investigated will be verified as completed.
- Restoration of the site to an appropriate level will be verified.
- All equipment will be inspected, packaged, and shipped to the appropriate location.
- All facilities-support infrastructures will be dismantled and shipped to the appropriate location, and the field site will be returned to the original condition prior to mobilization.

### 3.6 Procedures for Reporting and Disposition of MEC and MPPEH Items

This section discusses the procedures for reporting and disposing of MEC and MPPEH items encountered during the project, including the responsibilities of personnel, overall safety precautions, data reporting, transportation, safe holding areas, operations in populated/sensitive areas, demolition operations, and required engineering controls and EZs for intrusive operations and intentional detonations. The general responsibilities of project personnel are described in **Section 2.4**.

### 3.6.1 Overall Safety Precautions

The overall safety precautions described in **Section 2.5.1** of the MRP Master Project Plan will be adhered to during the intrusive investigation.

Qualified UXO personnel will dispose of all MEC items using BIP procedures by countercharging these items with an explosive donor charge and detonating the donor charge. This will be performed by a demolition team consisting of one UXO Technician III as the Demolition Supervisor and two UXO Technician II personnel, with the Senior UXO Supervisor (SUXOS) responsible for the operation.

### 3.6.2 Data Reporting

Data reporting for each metallic anomaly will be done in accordance with **Section 2.5.2** of the MRP Master Project Plan.

### 3.6.3 Operations in Populated and Sensitive Areas

Although no populated areas are located directly within the proposed UXO-06 investigation area boundary, there are populated areas around the perimeter that could be impacted by intrusive operations. As the MEC intrusive operations proceed towards areas containing transportation routes which fall within the public transportation route (PTR) distance, the field team leader (FTL) will coordinate with Base operations to implement traffic controls. Such controls may include temporarily closing Gonzales Boulevard during intrusive or detonation operations in which the PTR distance arc intersects the roadway (**Figure 3-1**).

If detonation of recovered MEC is required, these detonations could impact inhabitants of buildings. The EZ for intentional detonation will be determined for each detonation operation. If an inhabited building is impacted, the demolition team will attempt to mitigate this impact through the use of engineering controls. If engineering controls do not adequately reduce the exclusion, then the FTL will coordinate with Base operations to evacuate the inhabited buildings. If possible, demolition operations will be performed after regular building occupation hours.

There are no sensitive habitats or threatened and endangered species located within the UXO-06 area.

### 3.6.4 Exclusion Zones and Separation Distances

Based on the types of munitions used at UXO-06, the munition with the greatest fragmentation distance (MGFD) assumed for the site is a 0.5-pound net explosives weight (NEW) hazard division (HD) 1.1 bare block of trinitrotoluene (TNT). The maximum credible event (MCE) for intentional detonation of bare explosives, intentional detonation of MPPEH, and onsite consolidation, re-inspection, and storage of MPPEH is 1.0 lb. NEW HD 1.1. As this item is not fragment producing, K-factors will be applied to determine intentional detonation distance, PTR distance, team separation distance (TSD), and inhabited building distance (IBD).

**Figure 3-1** and **Table 3-1** identify the exclusion zones, which include the team separation distance (TSD) for personnel conducting intrusive operations within the MRS, the minimum

separation distance (MSD) for non-essential personnel, the PTR distance, and the inhabited building distance (IBD) for bare explosives and MPPEH under specified scenarios.

If, during the course of this project, a MEC item with a greater K-factor (non-fragment producing item) or with a greater fragmentation range than the primary MGF is encountered, an ESS amendment must be submitted. Work must stop until the ESS amendment is approved

## 3.7 Scrap and MD Disposition

The approach for collecting, inspecting, and segregating site debris is discussed in **Section 2.6.1** of the MRP Master Project Plan. If the item is identified as MEC, it is handled as described in **Section 6**.

### 3.7.1 Inspection, Certification, and Verification

MPPEH will be inspected, certified, and verified in accordance with **Section 2.6.2** of the MRP Master Project Plan. MPPEH that cannot be certified and verified as “Safe” will remain at the grid collection point and will be treated in the same manner as MEC (see **Section 6**).

### 3.7.2 Recording, Reporting, and Implementation of Lessons Learned during the Project

Lessons learned will be performed in accordance with **Section 2.7** of the MRP Master Project Plan.

SECTION 4

# Explosives Management Plan

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The management of explosives to support the removal and disposal of MEC and MPPEH items that may be discovered during the investigation at UXO-06 will be done in accordance with **Section 3** of the MRP Master Project Plan.

SECTION 5

# Explosives Siting Plan

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Explosives safety criteria for planning and siting explosives operations for the MEC removal action at UXO-06 are provided in **Section 4** of the MRP Master Plan. There are no planned or established MEC detonation areas. MEC will be blown in place where it is found. In addition, UXO collection points will not be used because items will be disposed of at the location where they are encountered.

## SECTION 6

# Quality Control Plan

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All applicable work conducted by CH2M HILL and its subcontractors at UXO-06 will be performed in accordance with the QCP in **Section 8** of the MRP Master Project Plans. The QCP describes the QC approach and procedures to be employed during the investigation of UXO-06.

The specific QC audit procedures for the definable features of work (DFOW) to be employed at UXO-06, including the phase during which it is performed, the frequency of performance, the pass/fail criteria, and actions to take if failure occurs, are presented in **Table 6-1**.

SECTION 7

# Environmental Protection Plan

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An environmental protection plan was developed for the UXO-06 under the CTO-168 project and is included in **Section 5** of the *Site-Specific Work Plan Addendum for PA/SI, Site UXO-06 Former Fortified Beach Assault Area* (CH2M HILL, 2007b).

SECTION 8

# References

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CH2M HILL. 2007a. *Draft MCB Camp Lejeune Munitions Response Program Master Project Plans, Marine Corps Base Camp Lejeune, Jacksonville, North Carolina*. July.

CH2M HILL, 2007b. *Draft Site-Specific Work Plan Addendum for Preliminary Assessment/Site Inspection Site UXO-06 Former Fortified Beach Assault Area, MCB Camp Lejeune, Jacksonville, North Carolina*. October.

United States Army Corps of Engineers (USACE). 2001. *Final Range Identification and Preliminary Range Assessment, Marine Corps Base Camp Lejeune, Onslow, North Carolina*. St. Louis District. December.

## Tables

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**TABLE 2-1**  
 Project Personnel Contact Information  
*Work Plan for Intrusive Investigation, UXO-06 Borrow Pit Expansion*  
*MCB Camp Lejeune*  
*Jacksonville, North Carolina*

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TABLE 3-1  
 Exclusion Zone Parameters  
 Work Plan for Intrusive Investigation, UXO-06 Borrow Pit Expansion  
 MCB Camp Lejeune

Scenario	Item	NEW	TSD (ft)	MSD (ft)	IBD (ft)	PTR (ft)
Unintentional Detonation	0.5 lb. Bare Block of TNT	0.5 lb. HD 1.1	32 <sup>a</sup>	32 <sup>a</sup>	NA	NA
Intentional Detonation	Bare Explosives	1.0 lb. HD 1.1 <sup>c</sup>	NA	328 <sup>b</sup>	NA	NA
Intentional Detonation	MPPEH	1.0 lb. HD 1.1 <sup>c</sup>	NA	328 <sup>b</sup>	NA	NA
Onsite Consolidation, Storage, and Re-inspection	MPPEH	1.0 lb. HD 1.1 <sup>c</sup>	NA	NA	40 <sup>a</sup>	24 <sup>d</sup>

**NOTES:**

- (a) Based on K40 of the NEW
- (b) Based on K328 of the NEW
- (c) Assumes 0.5 lb HD 1.1 plus 0.5 lb supplemental charge added for detonation
- (d) Based on 60% of K40 of the NEW

- HD – Hazard Division
- IBD – Inhabited Building Distance
- MPPEH – Material Potentially Presenting an Explosive Hazard
- MSD – Minimum Separation Distance
- NA – Not Applicable
- PTR – Public Transportation Route
- TNT - Trinitrotoluene
- TSD – Team Separation Distance

TABLE 6-1  
 Definable Features of Work Auditing Procedures  
 Work Plan for Munitions Response Activities, Site UXO-06 MILCON Area  
 MCB Camp Lejeune  
 Jacksonville, North Carolina

Definable Feature of Work with Auditable Function	Responsible Person(s) <sup>1</sup>	Audit Procedure	QC Phase <sup>2</sup>	Freq. of Audit	Pass/Fail Criteria	Action if Failure Occurs
<b>Planning</b>						
Document management and control (Pre-mobilization Activities)	Project Manager/Site Manager	Verify appropriate measures are in place to manage and control project documents.	PP	O	Appropriate measures are in place to manage and control project documents.	Do not proceed with field activities until criterion is passed.
Data Management (Pre-mobilization Activities)	Project Manager, Project Geophysicist	Verify appropriate measures are in place to manage and control project data.	PP	O	Appropriate measures are in place to manage and control project data.	Do not proceed with field activities until criterion is passed.
Subcontracting (Pre-mobilization Activities)	Project Manager, Site Manager	Verify subcontractor qualifications, training, and licenses.	PP/IP	O	Subcontractors' qualifications, training, and licenses are up to date and acceptable.	Ensure subcontractor provides the qualifications, training, and licenses or change subcontractor.
Technical and Operational approach (Project Planning)	Project Manager/Site Manager	Verify technical and operational approaches have been agreed on by the project team.	PP/IP	O	Technical and operational approaches have been agreed on by project team and incorporated into the Work Plans.	Do not proceed with field activities until criterion is passed
<b>Field Operations</b>						
Site preparation (Mobilization)	Project Manager, Site Manager	Verify local agencies are coordinated.	PP/IP	O	Local agencies are coordinated.	Do not proceed with field activities until criterion is passed.
Site preparation (Mobilization)	Project Manager, Site Manager	Verify equipment has been inspected and tested.	PP/IP	E	Equipment passes inspection and testing.	Proceed only with activities for which equipment has passed inspection and testing.
Site preparation (Mobilization)	Project Manager, Site Manager	Verify communications and other logistical support are coordinated.	PP/IP	O	Communications and other logistical support are coordinated.	Do not proceed with field activities until criterion is passed.
Site preparation (Mobilization)	Project Manager, Site Manager	Verify emergency services have been coordinated.	PP/IP	O	Emergency services are coordinated.	Do not proceed with field activities until criterion is passed.
Site preparation (Mobilization)	UXOQCS, Project Manager, Site Manager	Verify site-specific training is performed and acknowledged.	PP/IP	O	Site-specific training is performed and acknowledged	Do not proceed with field activities until criterion is passed.
Site preparation (Mobilization)	UXOQCS, Project Manager, Site Manager	Hold pre-mobilization meeting and Operations Readiness Review (ORR) with the project team.	PP/IP	O	Project plans are reviewed and acknowledged by team members.	Do not proceed with field activities until criterion is passed.
Reacquisition Accuracy	Project Geophysicist	Confirm that anomalies are located within a 1-meter radius of flagged location as selected by DGM.	FP	E	Anomaly located within 1-meter radius of flag	If anomalies are being located beyond 1-meter radius of flag or are not being located within 1-meter radius of the flag, a root-cause analysis must be performed and the project team must meet to discuss and determine appropriate action.
Intrusive Investigation	UXOQCS	Verify equipment tested IAW Section 7.0 of the Work Plan	IP/FP	D	Equipment testing performed and tests passed	Repair or replace instrument.
Intrusive Investigation	UXOQCS	Verify team separation distance is as established in Section 4.6.5 of the Work Plan	IP/FP	D	Team separation distance is appropriate for work being performed	Stop activities until appropriate separation distance is being followed
Intrusive Investigation	UXOQCS	Verify that the anomaly recovered during intrusive excavations is appropriate to the amplitude of the initial anomaly detected during the DGM.	IP/FP	D	Recovered anomaly is appropriate to the amplitude of the initial anomaly detected during the DGM.	Return to the location of the anomaly excavation to determine if additional anomalies are present. If anomalies being recovered continue to be inappropriate for the amplitude as detected during the DGM, a root-cause analysis must be performed and the project team must meet to discuss and determine appropriate action.
Intrusive Investigation	QC Geophysicist	QC seed items to be placed at detectable depths IAW GPO Work Plan	IP/FP	E	All QC seed items in area of operation recovered.	A root-cause analysis must be performed and the project team must meet to discuss and determine appropriate action

TABLE 6-1  
 Definable Features of Work Auditing Procedures  
 Work Plan for Munitions Response Activities, Site UXO-06 MILCON Area  
 MCB Camp Lejeune  
 Jacksonville, North Carolina

Definable Feature of Work with Auditable Function	Responsible Person(s) <sup>1</sup>	Audit Procedure	QC Phase <sup>2</sup>	Freq. of Audit	Pass/Fail Criteria	Action if Failure Occurs
Intrusive Investigation	UXOQCS	Verify operations are conducted IAW Work Plan, MEC Removal SOPs, and the HSP: - Survey/Sweeps - MEC Surface Sweeps - Analog Detection and Removal Actions - DGM Anomaly Investigation - Ammunition and Explosives Transportation - Explosives Storage and Accountability - Disposal/Demolition Operations - Scrap Inspection Operations	IP/FP	D	Work performed IAW Work Plan, referenced MEC SOPs, and the HSP.	Stop activity until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary
MPPEH/MD Management	UXOQCS	Verify inspections conducted IAW Work Plan	IP/FP	D/E	Inspections being conducted IAW Work Plan	Stop activity until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary
MPPEH/MD Management	UXOQCS	Verify certification conducted IAW Work Plan	IP/FP	D/E	Certification is conducted IAW Work Plan	Stop activity until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary
MPPEH/MD Management	UXOQCS	Verify disposal is conducted IAW Work Plan	IP/FP	D/E	Disposal is conducted IAW Work Plan	Stop activity until full compliance can be assured and any activities not performed within compliance are re-evaluated and re-performed if necessary
Site Restoration	Site Manager	Verify the damage caused by excavation and removal of anomalies is backfilled and laid to original grade and completed IAW Work Plan.	FP	O	Damage caused by excavation and removal of anomalies is backfilled and laid to original grade	Ensure that damage caused by excavation and removal of anomalies is backfilled and laid to original grade
Demobilization	Project Manager, Site Manager	Verify facilities-support infrastructures are dismantled and shipped to appropriate location and area is returned to original condition.	FP	O	Facilities-support infrastructures are dismantled and shipped to appropriate location and site is returned to original condition.	Ensure that all support facilities are removed and that the site is returned to original condition
<b>Final Project Reports and Closeout</b>						
Site Specific Final Report preparation and approval	Project Manager, Project Geophysicist	Verify tabulations of all material identified/recovered during the field actions are accurate and complete.	IP	O	Tabulations of all material identified/recovered during the field actions are accurate and complete.	Ensure tabulations of all material identified/recovered during the field actions are accurate and complete.
Site Specific Final Report preparation and approval	Project Manager, Project Geophysicist	Verify all dig sheets where geophysical mapping and investigation performed are accurate and complete.	FP	O	All dig sheets where geophysical mapping and investigation performed are accurate and complete.	Ensure all dig sheets where geophysical mapping and investigation performed are accurate and complete
Archiving	GIS Manager	Verify data back-up systems are in place.	IP	O	Data back-up systems are in place	Ensure data back-up systems are in place
Project Closeout	Project Manager	Verify purchase orders have been closed out.	IP	O	Purchase orders have been closed out	Ensure purchase orders are closed out
Project Closeout	Project Manager	Verify invoices completed and approved.	IP	O	Invoices completed and approved	Ensure invoices are completed and approved

Notes:  
 IAW = in accordance with

QC Phase                      Frequency  
 PP = Preparatory Phase      O = Once  
 IP = Initial Phase            D = Daily  
 FP = Follow-up Phase        W = Weekly  
    E = Each occurrence

<sup>1</sup> The responsible person (if other than the UXOQCS) is the individual with whom the UXOQCS will coordinate with to ensure compliance with requirements and to verify that any necessary follow-up actions are taken.

<sup>2</sup> Documentation to be in accordance with the three-phase control process as outlined in the Quality Control Plan.

## Figures

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**Legend**

- Previous Investigation Area
- UXO-06 Site Boundary
- Installation Area
- Buildings
- Vehicle Parking
- Roads
- Surface Water Body Area
- Borrow Pit
- Anomaly Acquisition Area

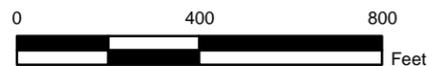
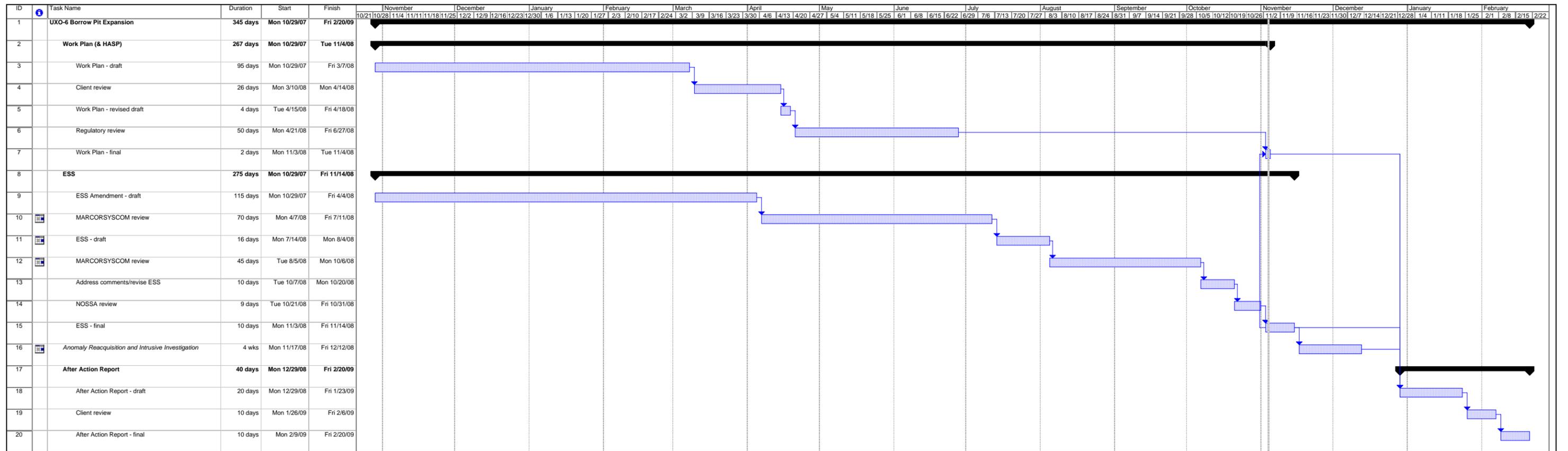
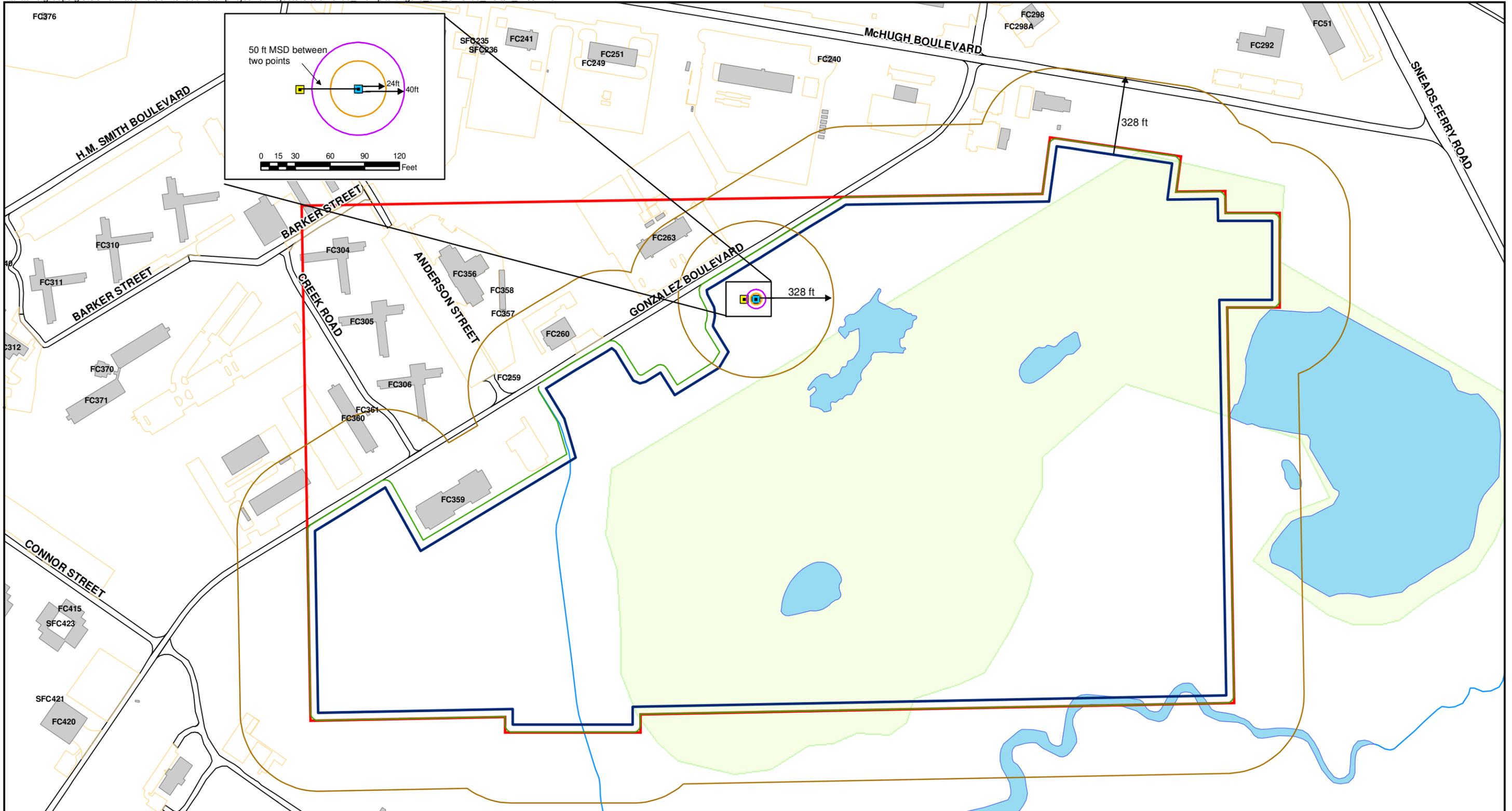


Figure 1-1  
UXO-06 Site Map  
MRP Site UXO-06, Fortified Beach Assault Area  
MCB Camp Lejeune, North Carolina



**Figure 2-1**  
Project Schedule  
UXO-06 Fortified Beach Assault Area  
MCB Camp Lejeune  
North Carolina



**Legend**

- MPPEH - Scrap Collection Point
- Non-MPPEH - Scrap Collection Point
- MSD/TSD for Unintentional Detonation = 32 ft
- PTR= 24 ft
- IBD = 40 ft
- MSD for Intentional Detonation = 328 ft
- UXO-06 Site Boundary
- UXO-06 Munitions Response Area
- Borrow Pit
- Buildings
- Vehicle Parking
- Roads
- Surface Water Body Area

IBD - Inhabited Building Distance  
 MSD - Minimum Separation Distance  
 PTR - Public Transportation Route  
 TSD - Team Separation Distance



Figure 3-1  
 Explosives Safety Quantity Distance (ESQD) Arcs  
 UXO-06 Borrow Pit Expansion Area  
 MCB Camp Lejeune, North Carolina

**Appendix A**  
**Health and Safety Plan**

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# CH2M HILL HEALTH AND SAFETY PLAN

This Health and Safety Plan (HASP) will be kept on the site during field activities and will be reviewed as necessary. The plan will be amended or revised as project activities or conditions change or when supplemental information becomes available. The plan adopts, by reference, the Standards of Practice (SOPs) in the CH2M HILL *Corporate Health and Safety Program, Program and Training Manual*, as appropriate. In addition, this plan adopts procedures in the project Work Plan. The Safety Coordinator- Haz Waste (SC-HW) is to be familiar with these SOPs and the contents of this plan. CH2M HILL's personnel and subcontractors must sign Attachment 1.

## Project Information and Description

**PROJECT NO:** 363366

**CLIENT:** NAVFAC Atlantic

**PROJECT/SITE NAME:** MULTI-MEDIA TO-09 / MCB Camp Lejeune, MRP Environmental Investigation UXO-06 Fortified Beach Assault Area

**SITE ADDRESS:** Jacksonville, North Carolina

**CH2M HILL PROJECT MANAGER:** Jessica Skeean/CLT

**CH2M HILL OFFICE:** Charlotte

**DATE HEALTH AND SAFETY PLAN PREPARED:** December 12, 2007

**DATE(S) OF SITE WORK:** January 2008 through March 2009

**SITE ACCESS:** Access to the site is restricted. Site UXO-06 may be accessed through the MCB Camp Lejeune Main Gate on the east side of the New River.

**SITE SIZE:** MCB Camp Lejeune is approximately 236 square miles. The Base has proposed expanding the existing borrow pit area within the boundary of UXO-06, which encompasses an area of approximately 177 acres.

**SITE TOPOGRAPHY:** The topography of MCB Camp Lejeune is relatively flat with ground surface elevations ranging from mean sea level (msl) to 72 feet above msl. Most of the MCB Camp Lejeune lies between 20 and 40 feet msl. The topography of Site UXO-06 is relatively flat except for the borrow pit area where the topographic relief is approximately 40 feet (ft). The 100-year flood plain elevation for this area of MCB Camp Lejeune is approximately 10 feet above msl.

**PREVAILING WEATHER:** The climate at MCB Camp Lejeune is characterized by mild winters and hot humid summers. Winters are usually short and mild with occasional and short duration cold periods. Summers are long, hot and humid. Average annual net precipitation is approximately 50 inches. Ambient air temperatures generally range from 33 to 53 degrees Fahrenheit (°F) in the winter months, and 71°F to 88°F during the summer months. Winds are generally south-southwesterly in the summer, and north-northwesterly in the winter (Water and Air Research, 1983). The hurricane season in the immediate area surrounding Camp Lejeune begins on June 1 and continues through November 30. Storms of non-tropical origins such as frontal passages, local thunderstorms, and tornadoes are more frequent and can occur year-round.

**BASE HISTORY:** Construction of MCB Camp Lejeune began in 1941 with the objective of developing the "World's Most Complete Amphibious Training Base". Construction of the Base started at Hadnot Point where the major functions of the Base are centered. During World War II, MCB Camp Lejeune was used as a training area to prepare Marines for combat. MCB Camp Lejeune was again used for training during the Korean and Vietnam conflicts, and the Gulf War. MCB Camp Lejeune is host to five Marine Corps commands and one Navy command. In addition, MCB Camp Lejeune provides support and training for the following tenet

commands: Headquarters Nucleus; Second Marine Expeditionary Force; Second Marine Division; Second Marine Force Service Support Group; Second Marine Surveillance, Reconnaissance, and Intelligence Group; Sixth Marine Expeditionary Brigade; the Naval Hospital; and the Naval Dental Clinic. All of the real estate and infrastructure are owned, operated, and maintained by the host command. The mission of Camp Lejeune is to maintain combat ready units for expeditionary deployment.

MCB Camp Lejeune is bisected by the New River, which flows in a southeasterly direction and forms a large estuary before entering the Atlantic Ocean. The Atlantic Ocean forms the southeastern boundary of the facility. The western and northwestern boundaries are U.S. Route 17 and State Route 24, respectively. The City of Jacksonville, North Carolina is located immediately northwest of MCB Camp Lejeune.

A majority of the land surrounding the facility is used for agriculture. Estuaries along the coast support commercial fishing and residential resort areas are located adjacent to MCB Camp Lejeune along the Atlantic Ocean.

MCB Camp Lejeune has proposed expanding the existing Base borrow pit. The site is located west of Sneads Ferry Road and south of Main Service Road. Based on a review of the aerial photograph and a site reconnaissance, it is assumed that approximately 50 percent of Site UXO-06 is heavily wooded with dense undergrowth. Several buildings/parking lots are located north of Gonzales Boulevard and one building/parking lot is south of Gonzales Boulevard.

#### **DESCRIPTION OF SPECIFIC TASKS TO BE PERFORMED:**

Site UXO-06 has the potential to include munitions and explosives of concerns (MEC) and/or environmental contamination with munitions constituents (MC). Due to historical activities within the project area, the following intrusive investigation activities are being conducted at the site:

- Reacquire all geophysical anomalies that were selected as potentially representing subsurface MEC
- Execute manual digging and identification of sources of anomalies
- Perform demilitarization of all MEC and material potentially presenting an explosive hazard (MPPEH) identified during the intrusive activity
- Perform removal verification and excavation backfilling

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# 1 Tasks to be performed under this Plan

## 1.1 Description of Tasks

(Reference Field Project Start-up Form)

Refer to project documents (i.e., Work Plan) for detailed task information. A health and safety risk analysis (Section 1.2) has been performed for each task and is incorporated in this plan through task-specific hazard controls and requirements for monitoring and protection. Tasks other than those listed below require an approved amendment or revision to this plan before tasks begin. Refer to Section 8.2 for procedures related to “clean” tasks that do not involve hazardous waste operations and emergency response (Hazwoper). All work will be performed in accordance with the approved Work Plan and the DDESB ESS.

### 1.1.1 Hazwoper-Regulated Tasks

- MEC Intrusive Investigation
- MEC Removal (If MEC is discovered)

### 1.1.2 Non-HAZWOPER-Regulated Tasks

Under specific circumstances, the training and medical monitoring requirements of federal or state HAZWOPER regulations are not applicable. It must be demonstrated that the tasks can be performed without the possibility of exposure in order to use non-HAZWOPER-trained personnel. **Prior approval from the Health and Safety Manager (HSM) is required before these tasks are conducted on regulated hazardous waste sites.**

## 1.2 Task Hazard Analysis

(Refer to Section 2 for hazard controls)

POTENTIAL HAZARDS	TASKS	
	MEC Intrusive Investigation	MEC Removal
Flying debris/objects		
Noise > 85dBA		
Electrical	X	X
Suspended loads		
Buried utilities, drums, tanks	X	X
Slip, trip, fall	X	X
Back injury	X	X
Visible lightning	X	X
Vehicle traffic	X	X
Fires		
MEC	X	X
Entanglement	X	X
Drilling		
Heavy equipment		
Working near water	X	X
IDW Drum Sampling		

## 2 Hazard Controls

This section provides safe work practices and control measures used to reduce or eliminate potential hazards. These practices and controls are to be implemented by the party in control of either the site or the particular hazard. CH2M HILL employees and subcontractors must remain aware of the hazards affecting them regardless of who is responsible for controlling the hazards. CH2M HILL employees and subcontractors who do not understand any of these provisions should contact the SC-HW for clarification.

In addition to the controls specified in this section, Project-Activity Self-Assessment Checklists are contained in Attachment 6. These checklists are to be used to assess the adequacy of CH2M HILL and subcontractor site-specific safety requirements. The objective of the self-assessment process is to identify gaps in project safety performance, and prompt for corrective actions in addressing these gaps. Self-assessment checklists should be completed early in the project, when tasks or conditions change, or when otherwise specified by the HSM. The self-assessment checklists, including documented corrective actions, should be made part of the permanent project records, and be promptly submitted to the HSM.

### Principles

Risk management is, and will continue to be, integrated into the planning, preparation, and execution of work on all operational sites during this project. Risk management is a dynamic process that continuously improves as personnel become familiar with site operations, the equipment, the environment, and such. Personnel are urged to continuously identify hazards and assess accident risks. Once identified, these hazards will be brought to the attention of the supervisor and/or the Project Manager (PM). Control measures will be developed and coordinated. All personnel are responsible for continuously assessing variable hazards and implementing risk controls.

### Constraints

Risk management does not convey authority to violate the law or deliberately disobey local, state, or national laws. Neither does it justify bypassing risk controls required by the law, such as life safety and fire protection codes, physical security, and transport and disposal of hazardous material and waste.

### Risk Management Process

The risk management process will be used by all personnel involved in the operations of the project. Every individual is responsible for the safety of operations and the identification of potential hazards. The SUXOS or UXOSO will cover all aspects of the appropriate AHA prior to that activity being conducted and ensure that all personnel understand the engineering controls being used and the personal protective equipment (PPE) that is issued. During operations, if any new hazards are identified or it is determined that the engineering controls or PPE are not appropriate, operations will cease and the following risk management process will be used to determine the appropriate course of action. The final actions or changes will be coordinated and approved by the MR Safety/Quality Officer, the UXOSO, and the PM. Prior to the changes being placed into effect, a written and approved change document will be in place. Once changed, all personnel on site will be briefed to this change and documentation of this briefing will be made available.

The AHAs and the pre-task safety plans are key elements to this process. All personnel are required to read and understand each document. This shall be accomplished in the morning safety briefing and again at the daily debriefing to bring out any changes or discrepancies in the process.

#### Step 1 - Identify hazards.

Tasks, terrain and weather, biological hazards, chemical/explosive hazards, physical hazards, health hazards, lack of resources, physical and emotional health of personnel, long-term project, and lack of planning time.

#### Step 2 - Assess hazards to determine risks.

**Hazard Probability:** The possibility of any hazard that may be present having an effect on personnel H&S or the working environment.

**Hazard Severity:** The severity of the impact on personnel if they were exposed to the hazard without any engineering controls or PPE. The severity can range from negligible to severe, which could cause loss of life.

#### Step 3 - Develop controls and make risk decisions.

**Engineering Controls** - Engineering controls are the most effective means to eliminate a hazard. Through engineering controls, the unpredictable human element is removed from the equation. Engineering controls can include such measures as barriers and guards, substitution, distance, or other measures to separate personnel from existing hazards.

**Personal Protective Equipment** - Where engineering controls cannot eliminate the hazard, PPE will be used in conjunction with engineering controls to prevent the hazardous exposure from impacting personnel.

**Administrative Controls** - Administrative controls are used to supplement engineering controls and PPE to ensure that the controls in place are working as planned. Administrative controls include training and education of the workforce, monitoring, standard operating procedures, inspection program, and signs to warn individuals that a hazard exists. Oversight personnel responsible for locating specific hazards fall into this category.

**Avoidance** - Avoidance controls are applied when positive action is required to prevent contact with an identified hazard.

**Criteria for controls** - To be effective, each control developed must meet the following criteria:

**Suitability** - It must remove the hazard or mitigate (reduce) the residual risk to an acceptable level.

**Feasibility** - Personnel must have the capability to implement the control.

**Acceptability** - The benefit gained by implementing the control must justify the cost in resources and time.

#### **Step 4 - Implement controls.**

Controls are converted into clear, simple execution orders understood at all levels.

Personnel are trained to ensure understanding of controls.

#### **Step 5 - Supervise and evaluate.**

Supervisors ensure controls are followed.

**Project-specific frequency for completing self-assessments: Bi-weekly or at the beginning of each project phase.**

## **2.1 General Hazards**

### **2.1.1 General Practices and Housekeeping**

- Site work should be performed during daylight hours whenever possible. Work conducted during hours of darkness requires enough illumination intensity to read a newspaper without difficulty.
- Good housekeeping must be maintained at all times in all project work areas.
- Common paths of travel should be established and kept free from the accumulation of materials.
- Keep access to aisles, exits, ladders, stairways, scaffolding, and emergency equipment free from obstructions.
- Provide slip-resistant surfaces, ropes, and/or other devices to be used.
- Specific areas should be designated for the proper storage of materials.
- Tools, equipment, materials, and supplies shall be stored in an orderly manner.
- As work progresses, scrap and unessential materials must be neatly stored or removed from the work area.
- Containers should be provided for collecting trash and other debris and shall be removed at regular intervals.
- All spills shall be quickly cleaned up. Oil and grease shall be cleaned from walking and working surfaces.

### **2.1.2 Hazard Communication**

(Reference CH2M HILL SOP HS-107, *Hazard Communication*)

The SC-HW is to perform the following:

- Complete an inventory of chemicals brought on site by CH2M HILL using Attachment 2.
- Confirm that an inventory of chemicals brought on site by CH2M HILL subcontractors is available.

- Request or confirm locations of Material Safety Data Sheets (MSDSs) from the client, contractors, and subcontractors for chemicals to which CH2M HILL employees potentially are exposed.
- Before or as the chemicals arrive on site, obtain an MSDS for each hazardous chemical.
- Label chemical containers with the identity of the chemical and with hazard warnings, and store properly.
- Give employees required chemical-specific HAZCOM training using Attachment 3.
- Store all materials properly, giving consideration to compatibility, quantity limits, secondary containment, fire prevention, and environmental conditions.

### 2.1.3 Shipping and Transportation of Chemical Products

(Reference CH2M HILL's *Procedures for Shipping and Transporting Dangerous Goods*)

Chemicals brought to the site might be defined as hazardous materials by the U.S. Department of Transportation (DOT). All staff who ship the materials or transport them by road must receive CH2M HILL training in shipping dangerous goods. All hazardous materials that are shipped (e.g., via Federal Express) or are transported by road must be properly identified, labeled, packed, and documented by trained staff. Contact the HSM or the Equipment Coordinator for additional information.

### 2.1.4 Manual Lifting

(Reference CH2M HILL SOP HS-112, *Manual Lifting*)

- Proper lifting techniques must be used when lifting any object.
  - Plan storage and staging to minimize lifting or carrying distances.
  - Split heavy loads into smaller loads.
  - Use mechanical lifting aids whenever possible.
  - Have someone assist with the lift -- especially for heavy or awkward loads.
  - Make sure the path of travel is clear prior to the lift.

### 2.1.5 Fire Prevention

- Fire extinguishers shall be provided so that the travel distance from any work area to the nearest extinguisher is less than 100 feet. When 5 gallons or more of a flammable or combustible liquid is being used, an extinguisher must be within 50 feet. Extinguishers must:
  - be maintained in a fully charged and operable condition,
  - be visually inspected each month, and
  - undergo a maintenance check each year.
- The area in front of extinguishers must be kept clear.
- Post "Exit" signs over exiting doors, and post "Fire Extinguisher" signs over extinguisher locations.
- Combustible materials stored outside should be at least 10 feet from any building.
- Solvent waste and oily rags must be kept in a fire resistant, covered container until removed from the site.
- Flammable/combustible liquids must be kept in approved containers, and must be stored in an approved storage cabinet.

### 2.1.6 Electrical

(Reference CH2M HILL SOP HS-206 *Electrical Safety*)

- Only qualified personnel are permitted to work on unprotected energized electrical systems.
- Only authorized personnel are permitted to enter high-voltage areas.
- Do not tamper with electrical wiring and equipment unless qualified to do so. All electrical wiring and equipment must be considered energized until lockout/tagout procedures are implemented.
- Inspect electrical equipment, power tools, and extension cords for damage prior to use. Do not use defective electrical equipment, remove from service.
- All temporary wiring, including extension cords and electrical power tools, must have ground fault circuit interrupters (GFCIs) installed.
- Extension cords must be:
  - equipped with third-wire grounding.
  - covered, elevated, or protected from damage when passing through work areas.
  - protected from pinching if routed through doorways.
  - not fastened with staples, hung from nails, or suspended with wire.

- Electrical power tools and equipment must be effectively grounded or double-insulated UL approved.
- Operate and maintain electric power tools and equipment according to manufacturers' instructions.
- Maintain safe clearance distances between overhead power lines and any electrical conducting material unless the power lines have been de-energized and grounded, or where insulating barriers have been installed to prevent physical contact. Maintain at least 10 feet from overhead power lines for voltages of 50 kV or less, and 10 feet plus ½ inch for every 1 kV over 50 kV.
- Temporary lights shall not be suspended by their electric cord unless designed for suspension. Lights shall be protected from accidental contact or breakage.
- Protect all electrical equipment, tools, switches, and outlets from environmental elements.

### **2.1.7 Heat Stress**

- Drink 16 ounces of water before beginning work. Disposable cups and water maintained at 50°F to 60°F should be available. Under severe conditions, drink 1 to 2 cups every 20 minutes, for a total of 1 to 2 gallons per day. Do not use alcohol in place of water or other nonalcoholic fluids. Decrease your intake of coffee and caffeinated soft drinks during working hours.
- Acclimate yourself by slowly increasing workloads (e.g., do not begin with extremely demanding activities).
- Use cooling devices, such as cooling vests, to aid natural body ventilation. These devices add weight, so their use should be balanced against efficiency.
- Use mobile showers or hose-down facilities to reduce body temperature and cool protective clothing.
- Conduct field activities in the early morning or evening and rotate shifts of workers, if possible.
- Avoid direct sun whenever possible, which can decrease physical efficiency and increase the probability of heat stress. Take regular breaks in a cool, shaded area. Use a wide-brim hat or an umbrella when working under direct sun for extended periods.
- Provide adequate shelter/shade to protect personnel against radiant heat (sun, flames, hot metal).
- Maintain good hygiene standards by frequently changing clothing and showering.
- Observe one another for signs of heat stress. Persons who experience signs of heat syncope, heat rash, or heat cramps should consult the SC-HW/DSC to avoid progression of heat-related illness.

#### **Monitoring Heat Stress**

These procedures should be considered when the ambient air temperature exceeds 70°F, the relative humidity is high (>50 percent), or when workers exhibit symptoms of heat stress.

The heart rate (HR) should be measured by the radial pulse for 30 seconds, as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 100 beats/minute, or 20 beats/minute above resting pulse. If the HR is higher, the next work period should be shortened by 33 percent, while the length of the rest period stays the same. If the pulse rate still exceeds 100 beats/minute at the beginning of the next rest period, the work cycle should be further shortened by 33 percent. The procedure is continued until the rate is maintained below 100 beats/minute, or 20 beats/minute above resting pulse.

SYMPTOMS AND TREATMENT OF HEAT STRESS					
	Heat Syncope	Heat Rash	Heat Cramps	Heat Exhaustion	Heat Stroke
Signs and Symptoms	Sluggishness or fainting while standing erect or immobile in heat.	Profuse tiny raised red blister-like vesicles on affected areas, along with prickling sensations during heat exposure.	Painful spasms in muscles used during work (arms, legs, or abdomen); onset during or after work hours.	Fatigue, nausea, headache, giddiness; skin clammy and moist; complexion pale, muddy, or flushed; may faint on standing; rapid thready pulse and low blood pressure; oral temperature normal or low	Red, hot, dry skin; dizziness; confusion; rapid breathing and pulse; high oral temperature.
Treatment	Remove to cooler area. Rest lying down. Increase fluid intake. Recovery usually is prompt and complete.	Use mild drying lotions and powders, and keep skin clean for drying skin and preventing infection.	Remove to cooler area. Rest lying down. Increase fluid intake.	Remove to cooler area. Rest lying down, with head in low position. Administer fluids by mouth. Seek medical attention.	Cool rapidly by soaking in cool—but not cold—water. Call ambulance, and get medical attention immediately!

### 2.1.8 Cold Stress

- Be aware of the symptoms of cold-related disorders, and wear proper, layered clothing for the anticipated fieldwork. Appropriate rain gear is a must in cool weather.
- Consider monitoring the work conditions and adjusting the work schedule using guidelines developed by the U.S. Army (wind-chill index) and the National Safety Council (NSC).
- Wind-Chill Index is used to estimate the combined effect of wind and low air temperatures on exposed skin. The wind-chill index does not take into account the body part that is exposed, the level of activity, or the amount or type of clothing worn. For those reasons, it should only be used as a guideline to warn workers when they are in a situation that can cause cold-related illnesses.
- NSC Guidelines for Work and Warm-Up Schedules can be used with the wind-chill index to estimate work and warm-up schedules for fieldwork. The guidelines are not absolute; workers should be monitored for symptoms of cold-related illnesses. If symptoms are not observed, the work duration can be increased.
- Persons who experience initial signs of immersion foot, frostbite, hypothermia should consult the SC-HW/DSC to avoid progression of cold-related illness.
- Observe one another for initial signs of cold-related disorders.
- Obtain and review weather forecast – be aware of predicted weather systems along with sudden drops in temperature, increase in winds, and precipitation.

SYMPTOMS AND TREATMENT OF COLD STRESS			
	Immersion (Trench) Foot	Frostbite	Hypothermia
Signs and Symptoms	Feet discolored and painful; infection and swelling present.	Blanched, white, waxy skin, but tissue resilient; tissue cold and pale.	Shivering, apathy, sleepiness; rapid drop in body temperature; glassy stare; slow pulse; slow respiration.
Treatment	Seek medical treatment immediately.	Remove victim to a warm place. Re-warm area quickly in warm—but <b>not</b> hot—water. Have victim drink warm fluids, but <b>not</b> coffee or alcohol. Do not break blisters. Elevate the injured area, and get medical attention.	Remove victim to a warm place. Have victim drink warm fluids, but <b>not</b> coffee or alcohol. Get medical attention.

### 2.1.9 Procedures for Locating Buried Utilities

Do not begin subsurface construction activities (e.g., trenching, excavation, drilling, etc.) until a check for underground utilities and similar obstructions has been conducted. The use of as-built drawings and utility company searches must be supplemented with a geophysical or other survey by a qualified, independent survey contractor to identify additional and undiscovered buried utilities.

Examples of the type of geophysical technologies include:

- **Ground Penetrating Radar (GPR)**, which can detect pipes, including gas pipes, tanks, conduits, cables etc, both metallic and non-metallic at depths up to 30 feet depending on equipment. Sensitivity for both minimum object size and maximum depth detectable depends on equipment selected, soil conditions, etc.
- **Radio Frequency (RF)**, involves inducing an RF signal in the pipe or cable and using a receiver to trace it. Some electric and telephone lines emit RF naturally and can be detected without an induced signal. This method requires knowing where the conductive utility can be accessed to induce RF field if necessary.
- **Dual RF**, a modified version of RF detection using multiple frequencies to enhance sensitivity but with similar limitations to RF
- **Ferromagnetic Detectors**, are metal detectors that will detect ferrous and non-ferrous utilities. Sensitivity is limited, e.g. a 100 mm iron disk to a depth of about one meter or a 25 mm steel paper clip to a depth of about 20 cm.
- **Electronic markers**, are emerging technologies that impart a unique electronic signature to materials such as polyethylene pipe to facilitate location and tracing after installation. Promising for future installations but not of help for most existing utilities already in place.

## Procedure

The following procedures shall be used to identify and mark underground utilities during subsurface construction activities on the project:

- The survey contractor shall determine the most appropriate geophysical technique or combinations of techniques to identify the buried utilities on the project, based on the survey contractor's experience and expertise, types of utilities anticipated to be present and specific site conditions.
- The survey contractor shall employ the same geophysical techniques used on the project to identify the buried utilities, to survey the proposed path of subsurface construction work to confirm no buried utilities are present.
- Identify customer specific permit and/or procedural requirements for excavation and drilling activities. For military installations contact the Base Civil Engineer and obtain the appropriate form to begin the clearance process.
- Contact utility companies or the state/regional utility protection service at least two (2) working days prior to excavation activities to advise of the proposed work, and ask them to establish the location of the utility underground installations prior to the start of actual excavation.
- Schedule the independent survey.
- Obtain utility clearances for subsurface work on both public and private property.
- Clearances are to be in writing, signed by the party conducting the clearance.
- Underground utility locations must be physically verified by hand digging using wood or fiberglass-handled tools when any adjacent subsurface construction activity (e.g. mechanical drilling, excavating) work is expected to come within 5 feet of the marked underground system. If subsurface construction activity is within 5 feet and parallel to a marked existing utility, the utility location must be exposed and verified by hand digging every 100 feet.
- Protect and preserve the markings of approximate locations of facilities until the markings are no longer required for safe and proper excavations. If the markings of utility locations are destroyed or removed before excavation commences or is completed, the Project Manager must notify the utility company or utility protection service to inform them that the markings have been destroyed.

- Conduct a site briefing for employees regarding the hazards associated with working near the utilities and the means by which the operation will maintain a safe working environment. Detail the method used to isolate the utility and the hazards presented by breaching the isolation..
- Monitor for signs of utilities during advancement of intrusive work (e.g., sudden change in advancement of auger or split spoon during drilling or change in color, texture or density during excavation that could indicate the ground has been previously disturbed).

## 2.2 Biological Hazards and Controls

### 2.2.1 Snakes

Snakes typically are found in underbrush and tall grassy areas. If you encounter a snake, stay calm and look around; there may be other snakes. Turn around and walk away on the same path you used to approach the area. If a person is bitten by a snake, wash and immobilize the injured area, keeping it lower than the heart if possible. Seek medical attention immediately. **DO NOT** apply ice, cut the wound, or apply a tourniquet. Try to identify the type of snake: note color, size, patterns, and markings.

### 2.2.2 Poison Ivy and Poison Sumac

Poison ivy, poison oak, and poison sumac typically are found in brush or wooded areas. They are more commonly found in moist areas or along the edges of wooded areas. Become familiar with the identity of these plants. Wear protective clothing that covers exposed skin and clothes. Avoid contact with plants and the outside of protective clothing. If skin contacts a plant, wash the area with soap and water immediately. If the reaction is severe or worsens, seek medical attention.

### 2.2.3 Ticks

Ticks typically are in wooded areas, bushes, tall grass, and brush. Ticks are black, black and red, or brown and can be up to one-quarter inch in size. Wear tightly woven light-colored clothing with long sleeves and pant legs tucked into boots; spray **only outside** of clothing with permethrin or permethrin and spray skin with only DEET; and check yourself frequently for ticks.

If bitten by a tick, grasp it at the point of attachment and carefully remove it. After removing the tick, wash your hands and disinfect and press the bite areas. Save the removed tick. Report the bite to human resources. Look for symptoms of Lyme disease or Rocky Mountain spotted fever (RMSF). Lyme: a rash might appear that looks like a bullseye with a small welt in the center. RMSF: a rash of red spots under the skin 3 to 10 days after the tick bite. In both cases, chills, fever, headache, fatigue, stiff neck, and bone pain may develop. If symptoms appear, seek medical attention.

### 2.2.4 Bees and Other Stinging Insects

Bee and other stinging insects may be encountered almost anywhere and may present a serious hazard, particularly to people who are allergic. Watch for and avoid nests. Keep exposed skin to a minimum. Carry a kit if you have had allergic reactions in the past, and inform the SC-HW and/or buddy. If a stinger is present, remove it carefully with tweezers. Wash and disinfect the wound, cover it, and apply ice. Watch for allergic reaction; seek medical attention if a reaction develops.

### 2.2.5 Bloodborne Pathogens

(Reference CH2M HILL SOP HS-202, *Bloodborne Pathogens*)

Exposure to bloodborne pathogens may occur when rendering first aid or CPR, or when coming into contact with landfill waste or waste streams containing potentially infectious material. Exposure controls and personal protective equipment (PPE) are required as specified in CH2M HILL SOP HS-202, *Bloodborne Pathogens*. Hepatitis B vaccination must be offered before the person participates in a task where exposure is a possibility.

## 2.2.6 Mosquito Bites

Due to the recent detection of the West Nile Virus in the Southeastern United States it is recommended that **preventative measures** be taken to reduce the probability of being bitten by mosquitoes whenever possible. Mosquitoes are believed to be the primary source for exposure to the West Nile Virus as well as several other types of encephalitis. The following guidelines should be followed to reduce the risk of these concerns for working in areas where mosquitoes are prevalent.

- Stay indoors at dawn, dusk, and in the early evening.
- Wear long-sleeved shirts and long pants whenever you are outdoors.
- Spray clothing with repellents containing permethrin or DEET since mosquitoes may bite through thin clothing.
- Apply insect repellent sparingly to exposed skin. An effective repellent will contain 35% DEET (N,N-diethyl-meta-toluamide). DEET in high concentrations (greater than 35%) provides no additional protection.
- Repellents may irritate the eyes and mouth, so avoid applying repellent to the hands.
- Whenever you use an insecticide or insect repellent, be sure to read and follow the manufacturer's **DIRECTIONS FOR USE**, as printed on the product.

Note: Vitamin B and "ultrasonic" devices are NOT effective in preventing mosquito bites.

### Symptoms of Exposure to the West Nile Virus

Most infections are mild, and symptoms include fever, headache, and body aches, occasionally with skin rash and swollen lymph glands. More severe infection may be marked by headache, high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, paralysis, and, rarely, death.

The West Nile Virus incubation period is from 3-15 days.

If you have any questions or to report any suspicious symptoms, contact the project Health and Safety Manager.

## 2.2.7 Fire Ant Bites

Fire ants are common in the southern U.S. These insects typically build mounds on the land surface that are usually easy to identify. Avoid disturbing these mounds. A bite from a fire ant can be painful but rarely is life threatening. However, it is possible that the bite could cause an allergic reaction. If bitten, check for symptoms of an allergic reaction such as weakness, nausea, vomiting, dizziness, or shortness of breath. If symptoms appear, seek medical attention

## 2.3 MEC

### 2.3.1 Munitions and Explosives of Concern

No documentation has been identified to indicate that MEC or material potentially presenting an explosive hazard (MPPEH) has ever been found at Site UXO-06.

Site UXO-06 was a Former Fortified Beach Assault Area used for military troop training. The area is not associated with an impact area, range, range fan, safety danger zone, or the disposal of military munitions. It is reported that munitions ranging from small arms to practice rockets and grenades were used in this area. Disposal of munitions and or burial of munitions is not reported or suspected. All work will follow the approved Work Plan which is based on the DDESB approved ESS.

### 2.3.2 Munitions with the Greatest Fragmentation Distance

Based on the types of munitions used at UXO-06, the munition with the greatest fragmentation distance (MGFD) assumed for the site is a ½-lb uncased block of trinitrotoluene (TNT).

The Explosives Safety Quantity-Distance (ESQD) information for the MGFD is provided in Chapter 3 of the ESS for this project. During the course of this project, if MEC with a greater fragmentation range is encountered, the ESQD requirements will be adjusted.

### 2.3.3 Hazard Mitigation

According to Mr. James Gagnon of the Natural Resources Conservation Service (NRCS), Edenton Technical Services Office, frost upheaval in the coastal plain region of North Carolina is considered unlikely since the climate only allows frost action to occur to a maximum depth of approximately 6 inches. Conditions favorable for erosion may be present in the vicinity of the existing borrow pit area. No other natural phenomena (e.g., drought, flooding, tidal changes) exist for this area. Therefore, migration of MEC (other than through human transport and erosion) is not considered likely.

### 2.3.4 Types of Explosives to be used on Site

No explosives are anticipated to be stored or used on the project site. During the course of this project, if MEC is encountered Explosive Ordnance Disposal (EOD) will be contact for disposal and/or explosives storage and usage will be reassessed.

### 2.3.5 Explosives Storage, Transportation and Management

No explosives are anticipated to be stored or used on the project site. If MEC is encountered, explosives storage, transportation and management will be in compliance with the Explosives Siting Plan (ESP), the DDESB-approved Explosives Safety Submission (ESS) and the Explosives Management Plan (EMP) for the project.

### 2.3.6 MEC Avoidance Procedures

As MEC avoidance operations will be required at Site UXO-06, during sampling operations. Avoidance operations will consist of a team composed of one or more UXO Technicians. **Contact with MEC is prohibited during avoidance activities.** The UXO Team will not destroy any MEC encountered. All MEC contacts and suspected MEC anomalies will be reported to the site manager who will in turn notify MCB Camp Lejeune personnel in accordance with contractual requirements.

## 2.4 Contaminants of Concern

(Refer to Project Files for more detailed contaminant information)

Contaminant	Location and Maximum <sup>a</sup> Concentration (ppm)	Exposure Limit <sup>b</sup>	IDLH <sup>c</sup>	Symptoms and Effects of Exposure	PIP <sup>d</sup> (eV)
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	GW: SB: SS:	NR	UN	Toxic by injection and ingestion.	NA
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	GW: SB: SS:	1.5 mg/m <sup>3</sup>	50	Skin, eye, and mucous membrane irritant. Exposure can cause convulsions.	NA
1,3,5-Trinitrobenzene (1,3,5-TNB)	GW: SB: SS:	NR	UN	Toxic by injection and ingestion. Some mutagenic data reported.	NA
1,3-Dinitrobenzene (1,3-DNB)	GW: SB: SS:	1 mg/m <sup>3</sup>	10	Toxic by skin contact. Liver and kidney damage. Damage to the central nervous system	NA
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	GW: SB: SS:	0.1 mg/m <sup>3</sup>	5	Toxic by injection and ingestion. Some mutagenic and tetragenic data reported	NA
Nitrobenzene	GW: SB: SS:	1 ppm	25	Toxic by skin exposure. Skin, eye, and mucous membrane irritant. Respiratory disruption. Anemia	9.92
2,4,6-Trinitrotoluene (2,4,6-TNT)	GW: SB: SS:	0.5 mg/m <sup>3</sup>	500	Toxic by skin exposure. Skin, eye, and mucous membrane irritant, Liver damage, jaundice. Cyanosis, dermal sensitization, sneezing, anemia, cardiac irregularity.	10.59
4-Amino-2,6-dinitrotoluene (4-Am-DNT)	GW: SB: SS:	1.5 mg/m <sup>3</sup>	50	Anoxia, cyanosis, anemia, jaundice, reproductive effects.	UN
2-Amino-4,6-dinitrotoluene (2-AM-DNT)	GW: SB: SS:	1.5 mg/m <sup>3</sup>	50	Anoxia, cyanosis, anemia, jaundice, reproductive effects.	UN
2,4-Dinitrotoluene (2,4-DNT)	GW: SB: SS:	1.5 mg/m <sup>3</sup>	50	Anoxia, cyanosis, anemia, jaundice, reproductive effects.	UN
2,6-Dinitrotoluene (2,6-DNT)	GW: SB: SS:	1.5 mg/m <sup>3</sup>	50	Anoxia, cyanosis, anemia, jaundice, reproductive effects.	UN

## 2.4 Contaminants of Concern

(Refer to Project Files for more detailed contaminant information)

Contaminant	Location and Maximum <sup>a</sup> Concentration (ppm)	Exposure Limit <sup>b</sup>	IDLH <sup>c</sup>	Symptoms and Effects of Exposure	PIP <sup>d</sup> (eV)
2-Nitrotoluene (2-NT)	GW: SB: SS:	2 ppm	200	Anoxia, cyanosis, anemia, headache, lassitude, dizziness	9.45
3-Nitrotoluene (3-NT)	GW: SB: SS:	2 ppm	200	Anoxia, cyanosis, anemia, headache, lassitude, dizziness	9.45
4-Nitrotoluene (4-NT)	GW: SB: SS:	2 ppm	200	Anoxia, cyanosis, anemia, headache, lassitude, dizziness	9.45
Perchlorate	GW: SB: SS:	UK	UK	Irritants to skin, eyes, and mucous membranes.	NA
Arsenic	GW: SB: SS:	0.01 mg/m <sup>3</sup>	5 Ca	Ulceration of nasal septum, respiratory irritation, dermatitis, gastrointestinal disturbances, peripheral neuropathy, hyperpigmentation	NA
Barium	GW: SB: SS:	0.5 mg/m <sup>3</sup>	50	Skin and eye irritation, slowed pulse, skin burns, gastroenteritis	NA
Cadmium	GW: SB: SS:	0.005 mg/m <sup>3</sup>	9 Ca	Pulmonary edema, coughing, chest tightness/pain, headache, chills, muscle aches, nausea, vomiting, diarrhea, difficulty breathing, loss of sense of smell, emphysema, mild anemia	NA
Chromium	GW: SB: SS:	0.5 mg/m <sup>3</sup>	25	Irritated eyes, sensitization dermatitis, histologic fibrosis of lungs	NA
Lead	GW: SB: SS:	0.05 mg/m <sup>3</sup>	100	Weakness lassitude, facial pallor, pal eye, weight loss, malnutrition, abdominal pain, constipation, anemia, gingival lead line, tremors, paralysis of wrist and ankles, encephalopathy, kidney disease, irritated eyes, hypertension	NA
Mercury	GW: SB: SS:	0.05 mg/m <sup>3</sup>	10	Skin and eye irritation, cough, chest pain, difficult breathing, bronchitis, pneumonitis, tremors, insomnia, irritability, indecision, headache, fatigue, weakness, GI disturbance	NA
Selenium	GW: SB: SS:	0.2 mg/m <sup>3</sup>	1	Skin and eye irritation, visual disturbance, metallic taste in the mouth, skin burns, dermatitis, chills.	NA
Silver	GW: SB: SS:	0.01 mg/m <sup>3</sup>	1	Argyrosis, discoloration of skin and nail beds, cyanosis.	NA

## 2.4 Contaminants of Concern

(Refer to Project Files for more detailed contaminant information)

Contaminant	Location and Maximum <sup>a</sup> Concentration (ppm)	Exposure Limit <sup>b</sup>	IDLH <sup>c</sup>	Symptoms and Effects of Exposure	PIP <sup>d</sup> (eV)
Footnotes: <sup>a</sup> Specify sample-designation and media: SB (Soil Boring), A (Air), D (Drums), GW (Groundwater), L (Lagoon), TK (Tank), S (Surface Soil), SL (Sludge), SW (Surface Water). <sup>b</sup> Appropriate value of PEL, REL, or TLV listed. <sup>c</sup> IDLH = immediately dangerous to life and health (units are the same as specified "Exposure Limit" units for that contaminant); NL = No limit found in reference materials; CA = Potential occupational carcinogen. <sup>d</sup> PIP = photoionization potential; NA = Not applicable; UK = Unknown. NR = Not Regulated UK					
<b>2.6 Potential Routes of Exposure</b>					
<b>Dermal:</b> Contact with contaminated media. This route of exposure is minimized through proper use of PPE, as specified in Section 4.					

### 3 Project Organization and Personnel

#### 3.1 CH2M HILL Employee Medical Surveillance and Training

(Reference CH2M HILL SOPs HS-113, *Medical Surveillance*, and HS-110, *Training*)

The employees listed below are enrolled in the CH2M HILL Comprehensive Health and Safety Program and meet state and federal hazardous waste operations requirements for 40-hour initial training, 3-day on-the-job experience, and 8-hour annual refresher training. Employees designated “SC-HW” have completed a 12-hour site safety coordinator course, and have documented requisite field experience. An SC-HW with a level designation (D, C, B) equal to or greater than the level of protection being used must be present during all tasks performed in exclusion or decontamination zones. Employees designated “FA-CPR” are currently certified by the American Red Cross, or equivalent, in first aid and CPR. At least two FA-CPR designated employees must be present during all tasks performed in exclusion or decontamination zones. The employees listed below are currently active in a medical surveillance program that meets state and federal regulatory requirements for hazardous waste operations. Certain tasks (e.g., confined-space entry) and contaminants (e.g., lead) may require additional training and medical monitoring.

Employee Name	Office	Responsibility	SC-HW/FA-CPR
Jessica Skeean	CLT	PM	Level D SC-HW: FA-CPR
Renee Clore	CLT	TM	Level D SC-HW: FA-CPR
TBD	CLT	FTL	Level D SC-HW: FA-CPR

#### 3.2 Field Team Chain of Command and Communication Procedures

##### 3.2.1 Client

###### Client Contact

Bryan Beck  
 NAVFAC Mid-Atlantic  
 Code: OPCEV  
 6506 Hampton Blvd  
 Norfolk, Virginia 23508-1278  
 Direct: (757) 322-4734  
 Fax: (757) 322-4805  
 bryan.k.beck@navy.mil

###### Base Contact

Robert Lowder  
 Camp Lejeune - EMD  
 Building 12  
 Marine Corps Base Camp Lejeune, NC 28542-0004  
 Direct (910) 451-9607  
 Fax: (910) 451-5997  
 robert.a.lowder@usmc.mil

##### 3.2.2 CH2M HILL

Project Manager: Jessica Skeean/CLT  
 Munitions Response Safety/Quality Officer: Dan Young/NVR  
 Health and Safety Manager: Michael Goldman/ATL  
 Munitions Response Senior Advisor: Tom Roth/ATL  
 Field Team Leader: TBD  
 Safety Coordinator- Hazardous Waste (SC-HW): TBD  
 UXO Safety Officer (UXOSO): TBD

The SC-HW is responsible for contacting the Field Team Leader and Project Manager. In general, the Project Manager will contact the client. The Health and Safety Manager should be contacted as appropriate.

### **UXO Subcontractor's Senior Unexploded Ordnance Supervisor (SUXOS)**

The SUXOS for this project will report directly to the Project Manager on issues pertaining to the MEC operations at UXO-06. The SUXOS will have the following safety and health related responsibilities:

- Reports directly to the CH2M HILL Project Manager;
- Managing the funding, manpower and equipment necessary to safely conduct site operations;
- Reviewing and becoming familiar with the site Work Plan (WP) and HASP;
- Provide copies of the WP and SSHP to site personnel;
- Review the scope of work (SOW) and ensure that the required safety and health elements are addressed in the SSHP and/or WP;
- Coordinating the assignment of personnel and ensuring that the personnel and equipment provided meet the requirements of the WP and SSHP;
- Ensuring implementation of project quality, safety and health procedures;
- Early detection and identification of potential problem areas, including safety & health matters, and instituting corrective measures;
- Directly interfacing with the Project manager and advising him of safety and health matters related to conduct of the site operations.
- Acts as the On-Scene-Incident-Commander (OSIC) in the event of an MEC emergency, notifying and coordinating with off site emergency and medical response agencies.

### **UXO Subcontractor's UXO TECHNICIANS**

All UXO Technicians are required to comply with the provisions of this Avoidance Plan, the SSHP, the WP and all applicable Federal, State and local regulations. They will report to the SUXOS.

### **3.2.3 CH2M HILL Subcontractors**

(Reference CH2M HILL SOP HS-215, *Contracts, Subcontracts, and HSE&Q Management Practices*)

#### **Subcontractor: To be determined**

Subcontractor Contact Name:

Telephone:

The subcontractors listed above are covered by this HSP and must be provided a copy of this plan. However, this plan does not address hazards associated with the tasks and equipment that the subcontractor has expertise in (e.g., drilling, excavation work, electrical). Subcontractors are responsible for the health and safety procedures specific to their work, and are required to these procedures submit (SOP & AHA, etc.) to CH2M HILL for review before the start of field work. Subcontractors must comply with the established health and safety plan(s). The CH2M HILL SC-HW should verify that subcontractor employee training, medical clearance, and fit test records are current and must monitor and enforce compliance with the established plan(s). CH2M HILL's oversight does not relieve subcontractors of their responsibility for effective implementation and compliance with the established plan(s).

CH2M HILL should continuously endeavor to observe subcontractors' safety performance. This endeavor should be reasonable, and include observing for hazards or unsafe practices that are both readily observable and occur in common work areas. CH2M HILL is not responsible for exhaustive observation for hazards and unsafe practices. In addition to this level of observation, the SC-HW is responsible for confirming CH2M HILL subcontractor performance against both the subcontractor's safety plan and applicable self-assessment checklists. Self-assessment checklists contained in Attachment 6 are to be used by the SC-HW to review subcontractor performance.

Health and safety related communications with CH2M HILL subcontractors should be conducted as follows:

- Brief subcontractors on the provisions of this plan, and require them to sign the Employee Signoff Form included in Attachment 1.
- Request subcontractor(s) to brief the project team on the hazards and precautions related to their work.
- When apparent non-compliance/unsafe conditions or practices are observed, notify the subcontractor safety representative and require corrective action – the subcontractor is responsible for determining and implementing necessary controls and corrective actions.
- When repeat non-compliance/unsafe conditions are observed, notify the subcontractor safety representative and stop affected work until adequate corrective measures are implemented.
- When an apparent imminent danger exists, immediately remove all affected CH2M HILL employees and subcontractors, notify subcontractor safety representative, and stop affected work until adequate corrective measures are implemented. Notify the Project Manager and HSM as appropriate.
- Document all oral health and safety related communications in project field logbook, daily reports, or other records.

### 3.2.4 Contractors

(Reference CH2M HILL SOP HS-215, *Contracts, Subcontracts, and HSE&Q Management Practices*)

#### **Contractor: To be determined**

Contractor Contact Name:

Telephone:

This plan does not cover contractors that are contracted directly to the client or the owner. CH2M HILL is not responsible for the health and safety or means and methods of the contractor's work, and we must never assume such responsibility through our actions (e.g., advising on H&S issues). In addition to this plan, CH2M HILL staff should review contractor safety plans so that we remain aware of appropriate precautions that apply to us. Except in unusual situations when conducted by the HSM, CH2M HILL must never comment on or approve contractor safety procedures. Self-assessment checklists contained in Attachment 6 are to be used by the SC-HW to review the contractor's performance ONLY as it pertains to evaluating our exposure and safety.

Health and safety related communications with contractors should be conducted as follows:

- Request the contractor to brief CH2M HILL employees and subcontractors on the precautions related to the contractor's work.
- When an apparent contractor non-compliance/unsafe condition or practice poses a risk to CH2M HILL employees or subcontractors:
  - Notify the contractor safety representative
  - Request that the contractor determine and implement corrective actions
  - If needed, stop affected CH2M HILL work until contractor corrects the condition or practice. Notify the client, Project Manager, and HSM as appropriate.
- If apparent contractor non-compliance/unsafe conditions or practices are observed, inform the contractor safety representative. Our obligation is limited strictly to informing the contractor of our observation – the contractor is solely responsible for determining and implementing necessary controls and corrective actions.
- If an apparent imminent danger is observed, immediately warn the contractor employee(s) in danger and notify the contractor safety representative. Our obligation is limited strictly to immediately warning the affected individual(s) and informing the contractor of our observation – the contractor is solely responsible for determining and implementing necessary controls and corrective actions.
- Document all oral health and safety related communications in project field logbook, daily reports, or other records.

## 4 Personal Protective Equipment (PPE)

(Reference CH2M HILL SOP HS-117, *Personal Protective Equipment*, HS-121, *Respiratory Protection*)

Note: UXO Technicians will NOT wear Steel-toed footwear.

### PPE Specifications <sup>a</sup>

Task	Level	Body	Head	Respirator <sup>b</sup>
General site entry Surveying	D	Work clothes; steel-toe, leather work boots; work glove.	Hardhat <sup>c</sup> Safety glasses Ear protection <sup>d</sup>	None required
Anomaly acquisition	Modified D	Work clothes or cotton coveralls <b>Boots:</b> Leather work boots (no steel toes) <b>Gloves:</b> Leather gloves	Hardhat <sup>c</sup> Safety glasses Ear protection <sup>d</sup>	None required
Tasks requiring upgrade	C	<b>Coveralls:</b> Uncoated Tyvek® <b>Boots:</b> Steel-toe, chemical-resistant boots OR steel-toe, leather work boots with outer rubber boot covers <b>Gloves:</b> Inner surgical-style nitrile & outer chemical-resistant nitrile gloves	Hardhat <sup>c</sup> Splash Shield <sup>c</sup> Safety glasses Ear protection <sup>d</sup>	Full face air purifying respirator fitted with organic vapor cartridges.

### Reasons for Upgrading or Downgrading Level of Protection

Upgrade <sup>f</sup>	Downgrade
<ul style="list-style-type: none"> <li>Request from individual performing tasks.</li> <li>Change in work tasks that will increase contact or potential contact with hazardous materials.</li> <li>Occurrence or likely occurrence of gas or vapor emission.</li> <li>Known or suspected presence of dermal hazards.</li> <li>Instrument action levels (Section 5) exceeded.</li> </ul>	<ul style="list-style-type: none"> <li>New information indicating that situation is less hazardous than originally thought.</li> <li>Change in site conditions that decreases the hazard.</li> <li>Change in work task that will reduce contact with hazardous materials.</li> </ul>

<sup>a</sup> Modifications are as indicated. CH2M HILL will provide PPE only to CH2M HILL employees.

<sup>b</sup> No facial hair that would interfere with respirator fit is permitted.

<sup>c</sup> Hardhat and splash-shield areas are to be determined by the SC-HW.

<sup>d</sup> Ear protection should be worn when conversations cannot be held at distances of 3 feet or less without shouting.

<sup>e</sup> Cartridge change-out schedule is at least every 8 hours (or one work day), except if relative humidity is > 85%, or if organic vapor measurements are > midpoint of Level C range (refer to Section 5)--then at least every 4 hours. If encountered conditions are different than those anticipated in this HSP, contact the HSM.

<sup>f</sup> Performing a task that requires an upgrade to a higher level of protection (e.g., Level D to Level C) is permitted only when the PPE requirements have been approved by the HSM, and an SC-HW qualified at that level is present.

## 5 Air Monitoring/Sampling

(Reference CH2M HILL SOP HS-207 - *Exposure Monitoring*)

### 5.1 Air Monitoring Specifications

Instrument	Tasks	Action Levels <sup>a</sup>		Frequency <sup>b</sup>	Calibration
<b>FID:</b> OVA model 128 or equivalent	Soil sampling, drilling and other intrusive work.	<1 ppm 1 to 10 ppm > 10 ppm	Level D Level C Evacuate work area and contact HSM	Initially and periodically during task	Daily
<b>PID:</b> OVM with 10.6eV lamp or equivalent	Soil sampling, drilling and other intrusive work.	<1 ppm 1 to 10 ppm > 10 ppm	Level D Level C Evacuate work area and contact HSM	Initially and periodically during task	Daily
<b>CGI:</b> MSA model 260 or 261 or equivalent	Soil sampling, drilling and other intrusive work.	0-10% : 10-25% LEL: >25% LEL:	No explosion hazard Potential explosion hazard Explosion hazard; evacuate or vent	Continuous during advancement of boring or trench	Daily
<b>O<sub>2</sub>Meter:</b> MSA model 260 or 261 or equivalent	Soil sampling, drilling and other intrusive work.	>25% <sup>c</sup> O <sub>2</sub> : 20.9% <sup>c</sup> O <sub>2</sub> : <19.5% <sup>c</sup> O <sub>2</sub> :	Explosion hazard; evacuate or vent Normal O <sub>2</sub> O <sub>2</sub> deficient; vent or use SCBA	Continuous during advancement of boring or trench	Daily

<sup>a</sup> Action levels apply to sustained breathing-zone measurements above background.

<sup>b</sup> The exact frequency of monitoring depends on field conditions and is to be determined by the SC-HW; generally, every 5 to 15 minutes if acceptable; more frequently may be appropriate. Monitoring results should be recorded. Documentation should include instrument and calibration information, time, measurement results, personnel monitored, and place/location where measurement is taken (e.g., "Breathing Zone/MW-3", "at surface/SB-2", etc.).

<sup>c</sup> If the measured percent of O<sub>2</sub> is less than 10, an accurate LEL reading will not be obtained. Percent LEL and percent O<sub>2</sub> action levels apply only to ambient working atmospheres, and not to confined-space entry. More-stringent percent LEL and O<sub>2</sub> action levels are required for confined-space entry (refer to Section 2).

<sup>d</sup> Refer to SOP HS-10 for instructions and documentation on radiation monitoring and screening.

<sup>e</sup> Noise monitoring and audiometric testing also required.

## 5.2 Calibration Specifications

(Refer to the respective manufacturer's instructions for proper instrument-maintenance procedures)

Instrument	Gas	Span	Reading	Method
<b>PID:</b> OVM, 10.6 or 11.8 eV bulb	100 ppm isobutylene	RF = 1.0	100 ppm	1.5 lpm reg T-tubing
<b>PID:</b> MiniRAE, 10.6 eV bulb	100 ppm isobutylene	CF = 100	100 ppm	1.5 lpm reg T-tubing
<b>PID:</b> TVA 1000	100 ppm isobutylene	CF = 1.0	100 ppm	1.5 lpm reg T-tubing
<b>FID:</b> OVA	100 ppm methane	$3.0 \pm 1.5$	100 ppm	1.5 lpm reg T-tubing
<b>FID:</b> TVA 1000	100 ppm methane	NA	100 ppm	2.5 lpm reg T-tubing
<b>Dust Monitor:</b> Miniram-PDM3	Dust-free air	Not applicable	0.00 mg/m <sup>3</sup> in "Measure" mode	Dust-free area OR Z-bag with HEPA filter
<b>CGI:</b> MSA 260, 261, 360, or 361	0.75% pentane	N/A	50% LEL $\pm$ 5% LEL	1.5 lpm reg direct tubing

## 5.3 Air Sampling

Sampling, in addition to real-time monitoring, may be required by other OSHA regulations where there may be exposure to certain contaminants. Air sampling typically is required when site contaminants include lead, cadmium, arsenic, asbestos, and certain volatile organic compounds. Contact the HSM immediately if these contaminants are encountered.

### Method Description

None anticipated.

### Personnel and Areas

Results must be sent immediately to the HSM. Regulations may require reporting to monitored personnel. Results reported to all personnel at the project site.

HSM: Michael Goldman/ATL

## 6 Decontamination

The SC-HW must establish and monitor the decontamination procedures and their effectiveness. Decontamination procedures found to be ineffective will be modified by the SC-HW. The SC-HW must ensure that procedures are established for disposing of materials generated on the site.

### 6.1 Decontamination Specifications

Personnel	Sample Equipment	Heavy Equipment
<ul style="list-style-type: none"> <li>• Boot wash/rinse</li> <li>• Glove wash/rinse</li> <li>• Outer-glove removal</li> <li>• Body-suit removal</li> <li>• Inner-glove removal</li> <li>• Respirator removal</li> <li>• Hand wash/rinse</li> <li>• Face wash/rinse</li> <li>• Shower ASAP</li> <li>• Dispose of PPE in municipal trash, or contain for disposal</li> <li>• Dispose of personnel rinse water to facility or sanitary sewer, or contain for offsite disposal</li> </ul>	<ul style="list-style-type: none"> <li>• Wash/rinse equipment</li> <li>• Solvent-rinse equipment</li> <li>• Contain solvent waste for offsite disposal</li> </ul>	<ul style="list-style-type: none"> <li>• Power wash</li> <li>• Steam clean</li> <li>• Dispose of equipment rinse water to facility or sanitary sewer, or contain for offsite disposal</li> </ul>

### 6.2 Diagram of Personnel-Decontamination Line

No eating, drinking, or smoking is permitted in contaminated areas and in exclusion or decontamination zones. The SC-HW should establish areas for eating, drinking, and smoking. Contact lenses are not permitted in exclusion or decontamination zones.

Figure 6-1 illustrates a conceptual establishment of work zones, including the decontamination line. Work zones are to be modified by the SC-HW to accommodate task-specific requirements.

## 7 Spill-Containment Procedures

Sorbent material will be maintained in the support zone. Incidental spills will be contained with sorbent and disposed of properly.

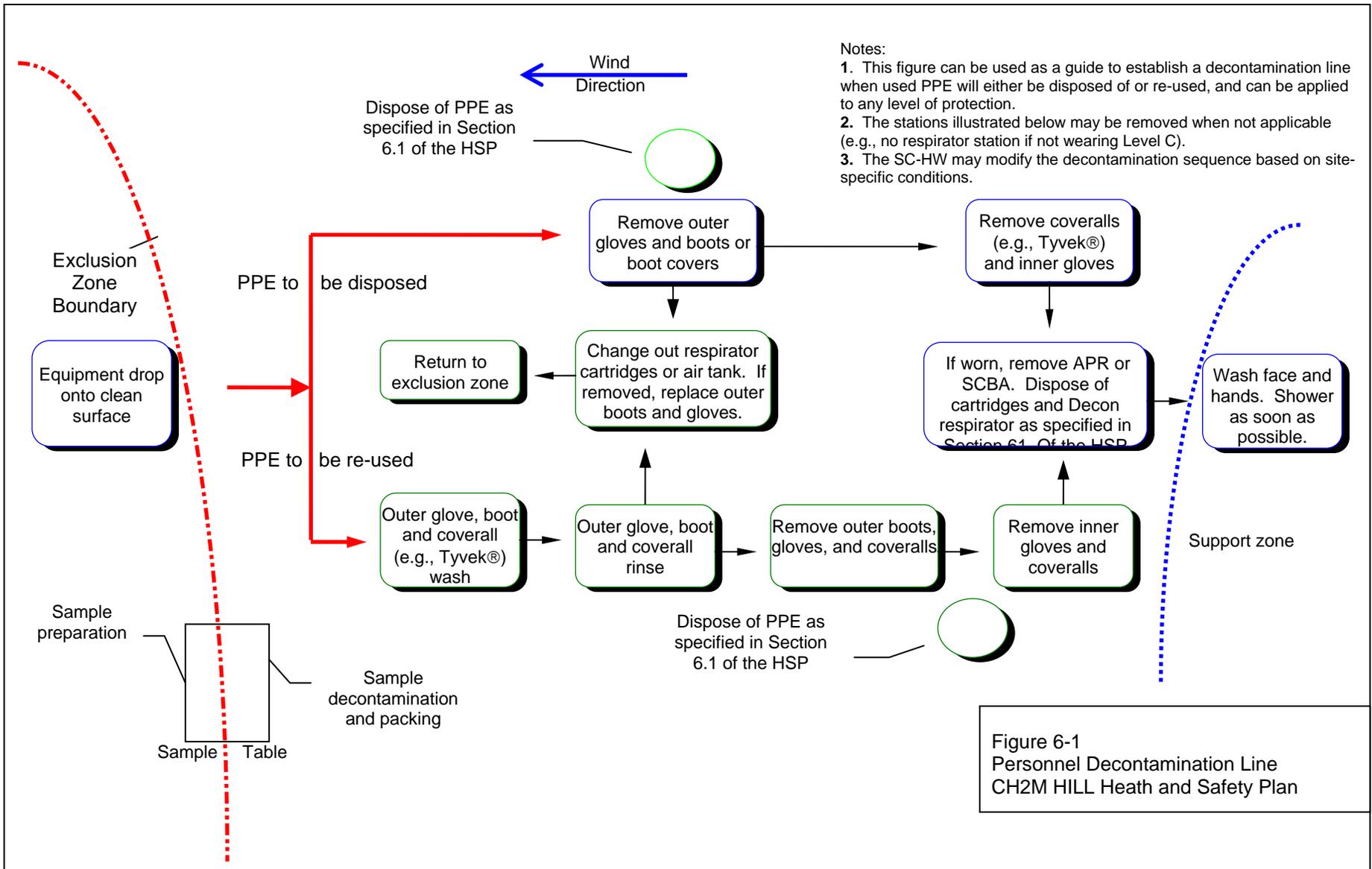


Figure 6-1  
Personnel Decontamination Line  
CH2M HILL Health and Safety Plan

## 8 Site-Control Plan

### 8.1 Site-Control Procedures

- The SC-HW will conduct a site safety briefing (see below) before starting field activities or as tasks and site conditions change.
- Topics for briefing on site safety: general discussion of Health and Safety Plan, site-specific hazards, locations of work zones, PPE requirements, equipment, special procedures, emergencies.
- The SC-HW records attendance at safety briefings in a logbook and documents the topics discussed.
- Post the OSHA job-site poster in a central and conspicuous location.
- Establish support, decontamination, and exclusion zones. Delineate with flags or cones as appropriate. Support zone should be upwind of the site. Use access control at entry and exit from each work zone.
- Establish onsite communication consisting of the following:
  - Line-of-sight and hand signals
  - Air horn
  - Two-way radio or cellular telephone if available
- Establish offsite communication.
- Establish and maintain the “buddy system.”
- Initial air monitoring is conducted by the SC-HW in appropriate level of protection.
- The SC-HW is to conduct periodic inspections of work practices to determine the effectiveness of this plan – refer to Sections 2 and 3. Deficiencies are to be noted, reported to the HSM, and corrected.

### 8.2 Site Control

The Unexploded Ordnance Safety Officer (UXOSO)II coordinates access control and security on site. Due to the hazardous nature of MEC work, only authorized personnel will be allowed within the specified Exclusion Zone (EZ) Authorized personnel are those that have completed the required training, meet medical requirements and are essential to the ongoing operation. During duty hours, personnel will provide security at the site. All work will stop if any unauthorized personnel enters the EZ. This will ensure the field team’s safety and the safety of those approaching the work site. Equipment will be returned to a designated area and secured at the end of each work day. Future site control measures to ensure safety are as follows;

- Eating, drinking and smoking are prohibited except in designated areas;
- MEC operations will cease if non-UXO trained or non-essential personnel are present;
- A UXO Technician III or II will escort all authorized visitors to the site;
- The UXOSO will maintain the site entry control log to ensure accurate accountability of personnel;
- The UXOSO will brief this UXO Avoidance Plan to all personnel entering the site to inform them of the potential site hazards. All personnel will acknowledge this briefing by signing the briefing log;
- In case of an emergency, personnel will exit the site and move to the designated safe area. The UXOSO will determine the severity of the emergency. If the emergency warrants evacuation, the UXOSO will evacuate the area and notify the Project Manager.

### 8.3 Hazwoper Compliance Plan

Certain parts of the site work are covered by state or federal Hazwoper standards and therefore require training and medical monitoring. Anticipated Hazwoper tasks (Section 1.1.1) might occur consecutively or concurrently with respect to non-Hazwoper tasks. This section outlines procedures to be followed when approved activities specified in Section 1.1.2 do not require 24- or 40-hour training. Non-Hazwoper-trained personnel also must be trained in accordance with all other state and federal OSHA requirements.

- In many cases, air sampling, in addition to real-time monitoring, must confirm that there is no exposure to gases or vapors before non-Hazwoper-trained personnel are allowed on the site, or while non-Hazwoper-trained staff are working in proximity to Hazwoper activities. Other data (e.g., soil) also must document

that there is no potential for exposure. The HSM must approve the interpretation of these data. Refer to subsections 2.5 and 5.3 for contaminant data and air sampling requirements, respectively.

- When non-Hazwoper-trained personnel are at risk of exposure, the SC-HW must post the exclusion zone and inform non-Hazwoper-trained personnel of the:
  - nature of the existing contamination and its locations
  - limitations of their access
  - emergency action plan for the site
- Periodic air monitoring with direct-reading instruments conducted during regulated tasks also should be used to ensure that non-Hazwoper-trained personnel (e.g., in an adjacent area) are not exposed to airborne contaminants.
- When exposure is possible, non-Hazwoper-trained personnel must be removed from the site until it can be demonstrated that there is no longer a potential for exposure to health and safety hazards.
- Remediation treatment system start-ups: Once a treatment system begins to pump and treat contaminated media, the site is, for the purposes of applying the Hazwoper standard, considered a treatment, storage, and disposal facility (TSDF). Therefore, once the system begins operation, only Hazwoper-trained personnel (minimum of 24 hour of training) will be permitted to enter the site. All non-Hazwoper-trained personnel must not enter the TSDF area of the site.

## 9 Emergency Response Plan

(Reference CH2M HILL, SOP HS-106, *Emergency Planning*)

### 9.1 Pre-Emergency Planning

The SC-HW performs the applicable pre-emergency planning tasks before starting field activities and coordinates emergency response with CH2M HILL onsite parties, the facility, and local emergency-service providers as appropriate.

- Review the facility emergency and contingency plans where applicable.
- Determine what onsite communication equipment is available (e.g., two-way radio, air horn).
- Determine what offsite communication equipment is needed (e.g., nearest telephone, cell phone).
- Confirm and post emergency telephone numbers, evacuation routes, assembly areas, and route to hospital; communicate the information to onsite personnel.
- Field Trailers: Post “Exit” signs above exit doors, and post “Fire Extinguisher” signs above locations of extinguishers. Keep areas near exits and extinguishers clear.
- Review changed site conditions, onsite operations, and personnel availability in relation to emergency response procedures.
- Where appropriate and acceptable to the client, inform emergency room and ambulance and emergency response teams of anticipated types of site emergencies.
- Designate one vehicle as the emergency vehicle; place hospital directions and map inside; keep keys in ignition during field activities.
- Inventory and check site emergency equipment, supplies, and potable water.
- Communicate emergency procedures for personnel injury, exposures, fires, explosions, and releases.
- Rehearse the emergency response plan before site activities begin, including driving route to hospital.
- Brief new workers on the emergency response plan.

The SC-HW will evaluate emergency response actions and initiate appropriate follow-up actions.

### 9.2 Emergency Equipment and Supplies

The SC-HW should mark the locations of emergency equipment on the site map and post the map.

<b>Emergency Equipment and Supplies</b>	<b>Location</b>
20 LB (or two 10-lb) fire extinguisher (A, B, and C classes)	Support Zone/Heavy Equipment
First aid kit	Support Zone/Field Vehicle
Eye Wash	Support & Decon Zone/Field Vehicle
Potable water	Support & Decon Zone/Field Vehicle
Bloodborne-pathogen kit	Support Zone/Field Vehicle
Additional equipment (specify):	

### 9.3 Incident Response

In fires, explosions, or chemical releases, actions to be taken include the following:

- Shut down CH2M HILL operations and evacuate the immediate work area.
- Notify appropriate response personnel.
- Account for personnel at the designated assembly area(s).
- Assess the need for site evacuation, and evacuate the site as warranted.

Instead of implementing a work-area evacuation, note that small fires or spills posing minimal safety or health hazards may be controlled.

## 9.4 Emergency Medical Treatment

Work Related injuries will be reported via the 1-800-756-1130 after the individual's supervisor has been notified.

The procedures listed below may also be applied to non-emergency incidents. Injuries and illnesses (including overexposure to contaminants) must be reported to Human Resources. If there is doubt about whether medical treatment is necessary, or if the injured person is reluctant to accept medical treatment, contact the CH2M HILL medical consultant. During non-emergencies, follow these procedures as appropriate.

- Notify appropriate emergency response authorities listed in Section 9.8 (e.g., 911).
- The SC-HW will assume charge during a medical emergency until the ambulance arrives or until the injured person is admitted to the emergency room.
- Prevent further injury.
- Initiate first aid and CPR where feasible.
- Get medical attention immediately.
- Perform decontamination where feasible; lifesaving and first aid or medical treatment take priority.
- Make certain that the injured person is accompanied to the emergency room.
- When contacting the medical consultant, state that the situation is a CH2M HILL matter, and give your name and telephone number, the name of the injured person, the extent of the injury or exposure, and the name and location of the medical facility where the injured person was taken.
- Report incident as outlined in Section 9.7.

## 9.5 Evacuation

- Evacuation routes and assembly areas (and alternative routes and assembly areas) are specified on the site map.
- Evacuation route(s) and assembly area(s) will be designated by the SC-HW before work begins.
- Personnel will assemble at the assembly area(s) upon hearing the emergency signal for evacuation.
- The SC-HW and a "buddy" will remain on the site after the site has been evacuated (if safe) to assist local responders and advise them of the nature and location of the incident.
- The SC-HW will account for all personnel in the onsite assembly area.
- A designated person will account for personnel at alternate assembly area(s).
- The SC-HW will write up the incident as soon as possible after it occurs and submit a report to the Corporate Director of Health and Safety.

## 9.6 Evacuation Signals

Signal	Meaning
Grasping throat with hand	Emergency-help me.
Thumbs up	OK; understood.
Grasping buddy's wrist	Leave area now.
Continuous sounding of horn	Emergency; leave site now.

## 9.7 Incident Notification and Reporting

*(Reference: Incident Notification, Reporting and Investigation HSE&Q SOP 111)*

- Upon any project incident (fire, spill, injury, near miss, death, etc.), immediately notify the PM and HSM. Call emergency beeper number if HSM is unavailable.
- For CH2M HILL work-related injuries or illnesses, contact and help Human Resources administrator complete an Incident Report Form (IRF). IRF must be completed within 24 hours of incident.

- For CH2M HILL subcontractor incidents, complete the Subcontractor Accident/Illness Report Form and submit to the HSM.
- Notify and submit reports to client as required in contract.

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## 10 Approval

This site-specific Health and Safety Plan has been written for use by CH2M HILL only. CH2M HILL claims no responsibility for its use by others unless that use has been specified and defined in project or contract documents. The plan is written for the specific site conditions, purposes, dates, and personnel specified and must be amended if those conditions change.

### 10.1 Original Plan

**Written By:** Renee Clore/CLT

**Date:** December 12, 2007

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**Approved By:** Michael Goldman

**Date:** January 22, 2008

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**Approved By:**

**Date:**

### 10.2 Revisions

**Revisions Made By:**

**Date:**

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**Revisions to Plan:**

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**Revisions Approved By:**

**Date:**

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## 11 Attachments

Attachment 1: Employee Signoff Form – Field Safety Instructions  
Attachment 2: Project-Specific Chemical Product Hazard Communication Form  
Attachment 3: Chemical-Specific Training Form  
Attachment 4: Emergency Contacts  
Attachment 5: Project H&S Forms/Permits  
Attachment 6: Project Activity Self-Assessment Checklists  
Attachment 7: Applicable Material Safety Data Sheets





**CHEMICAL-SPECIFIC TRAINING FORM**

Location:	Project #: 363366
HCC:	Trainer:

**TRAINING PARTICIPANTS:**

NAME	SIGNATURE	NAME	SIGNATURE

**REGULATED PRODUCTS/TASKS COVERED BY THIS TRAINING:**


The HCC shall use the product MSDS to provide the following information concerning each of the products listed above.

- Physical and health hazards
- Control measures that can be used to provide protection (including appropriate work practices, emergency procedures, and personal protective equipment to be used)
- Methods and observations used to detect the presence or release of the regulated product in the workplace (including periodic monitoring, continuous monitoring devices, visual appearance or odor of regulated product when being released, etc.)

Training participants shall have the opportunity to ask questions concerning these products and, upon completion of this training, will understand the product hazards and appropriate control measures available for their protection.

Copies of MSDSs, chemical inventories, and CH2M HILL’s written hazard communication program shall be made available for employee review in the facility/project hazard communication file.

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**EMERGENCY CONTACTS****CH2M HILL 24 Hour Emergency Contact – 1 800/756-1130**

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If an injury occurs, notify the injured person's personnel office as soon as possible after obtaining medical attention for the injured person. Notification **MUST** be made within 24 hours of the injury.

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**Medical Emergency – 911 or**

Hospital ER (On-Base) #: (910) 451-4840  
(910) 451-4841  
(910) 451-4842  
Onslow County ER (Off-Base) #: (910) 577-2240  
Ambulance (On-Base) #: (910) 451-3004  
(910) 451-3005  
Ambulance (Public) #: (910) 451-9111  
LEPC (Poison Control)#: (800) 222-1222

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**CH2M HILL Medical Consultant**

800/756-1130  
(After hours calls will be returned within 20 minutes)

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**Fire/Spill Emergency – 911 or**

Base Fire Response #: (910) 451-9111

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**Local Occupational Physician**

Occupational Medicine Specialists  
4815 Oleander Dr.  
Wilmington, NC 28403  
910 452-1111

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**Security & Police – 911 or**

Base Security #: (910) 451-2555

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**Corporate Director Health and Safety**

Name: Keith Christopher  
Phone: 703/335-1113

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**On-Scene Coordinator**

Name: Fire Chief  
Phone: (910) 451-5815

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**Environmental Management Division (EMD)**

Names: Bob Lowder  
Phone: (910) 451-9607

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**Utilities Emergency**

Water:  
Gas: Contact Base EMD  
Electric:

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**Health and Safety Manager (HSM)**

Name: Michael Goldman/ATL  
Phone: 770/604-9182  
Cell: 770/331-3127

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**Designated Safety Coordinator (DSC)**

Name:  
Phone:

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**Regional Human Resources Department**

Name: Carol Miscoe/SAN  
Phone: 210/377-3085 x291

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**Project Manager see Site-Specific HSP**

Name: Jessica Skeean/CLT  
Phone: 704-329-0073 x251

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**Corporate Human Resources Department**

Name: Pete Hannon/DEN  
Phone: 720/286-3077 x60337  
Cell: 303/886-1229

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**Federal Express Dangerous Goods Shipping**

Phone: 800/238-5355

**CH2M HILL Emergency Number for Shipping Dangerous Goods**

Phone: 800/255-3924

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**Worker's Compensation and Auto Claims**

Zurich Insurance Company  
Phone: 800/382-2150

Report fatalities AND report vehicular accidents involving pedestrians, motorcycles, or more than two cars.

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Contact the Project Manager. Generally, the Project Manager will contact relevant government agencies.

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**Facility Alarms:** TBD

**Evacuation Assembly Area(s):** TBD by the SC-HW; will probably be the local hotel where the field team is staying

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**Facility/Site Evacuation Route(s):** follow main roads towards access gates and off the Base

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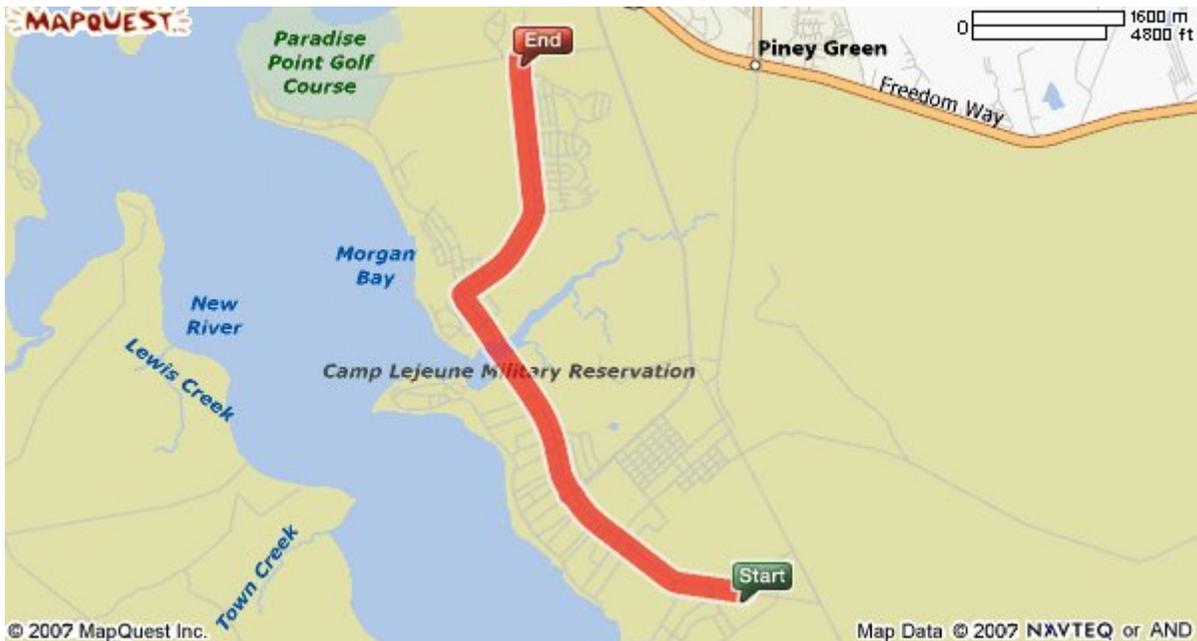
**Route to Hospital: (Depends on location within base area)**

**Nearest On-Base Hospital**

Base Naval Hospital (only to be used in extreme emergency)  
Building NH100  
100 Brewster Blvd  
Camp Lejeune, NC 28547  
Phone: 910-451-4840

**Directions:**

1. Proceed northwest on Main Service Road (McHugh Boulevard).
2. Continue for 3 miles on Main Service Road.
3. Main Service Road becomes Seth Williams Boulevard).
4. Continue on Seth Williams Boulevard for 0.5 miles.
5. Turn right onto Stone Street.
6. Continue for 2.2 miles on Stone Street.
7. The Hospital driveway will be immediately ahead, proceed to emergency room.



**Local hospital:**

Onslow County Memorial Hospital  
317 Western Boulevard  
Jacksonville, NC 28546  
Phone: (910) 577-2240

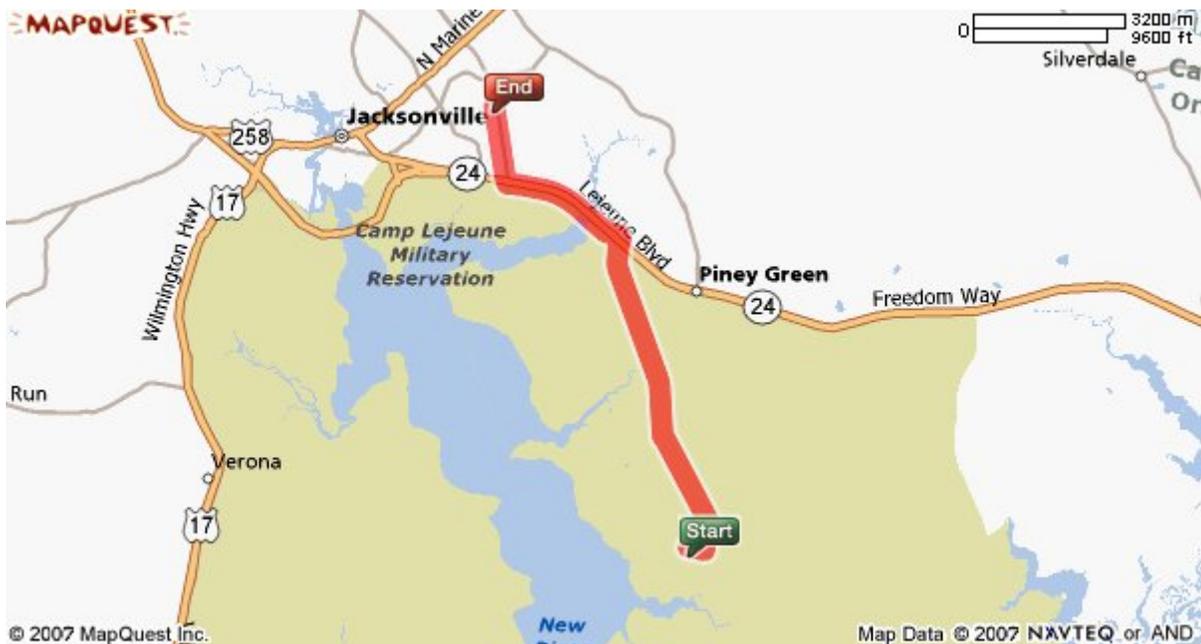
**Local ambulance service:**

Base Ambulance: (910) 451-3004, (910) 451-3005  
Public Ambulance: (910) 451-9111

**From MCB Camp Lejeune**

Directions to Onslow County Memorial Hospital:

1. Follow Gonzalez Boulevard northeast towards Sneads Ferry Road
2. Turn left on Sneads Ferry Road.
3. Continue approximately 1.7 miles on Sneads Ferry Road.
4. Turn right on Holcomb Boulevard.
5. Continue approximately 3.5 miles on Holcomb Boulevard.
6. Merge onto Highway 24 west.
7. Continue approximately 2.2 miles on Highway 24.
8. Turn right onto Western Boulevard.
9. Continue approximately 1.3 miles.
10. The Onslow County Memorial Hospital is on the left.
11. Follow signs to the emergency room.



# **CH2M HILL HEALTH AND SAFETY PLAN**

## **Attachment 5**

### **Project H&S Forms and Permits**

**To be completed as needed for task specific operations.**

# **CH2M HILL HEALTH AND SAFETY PLAN**

## **Attachment 6**

### **Applicable Material Safety Data Sheets**

Appendix B  
MEC Removal Standard Operating Procedures

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**STANDARD OPERATING PROCEDURE – OPS-14  
MEC ANALOG DETECTION AND REMOVAL ACTIONS****1.0 PURPOSE**

The purpose of this Standard Operating Procedure (SOP) is to provide all USA Environmental, Inc. (USAE) employees and subcontractors with the minimum procedures and safety and health requirements applicable to the conduct of analog detection and removal actions (mag and dig) at sites potentially containing unexploded ordnance (UXO) and/or munitions and explosives of concern (MEC).

**2.0 SCOPE**

This SOP applies to all USAE site personnel, including contractor and subcontractor personnel, involved in the conduct of analog detection and removal actions (mag and dig) on a UXO/MEC contaminated site. The following USAE policies and procedures are not all inclusive nor are they applicable in all situations. This SOP is not a stand-alone document and is to be used together with Work Plans, other USAE SOPs, the USAE Site Safety and Health Plan (SSHP), applicable Federal, State, and local regulations, and contract restrictions and guidance. Consult the documents listed in Section 7.0 of this SOP for additional compliance issues.

**3.0 RESPONSIBILITIES****3.1 PROJECT MANAGER**

The Project Manager is responsible for ensuring availability of resources to safely and effectively implement this SOP.

**3.2 SITE MANAGER**

The Site Manager is responsible for incorporating this SOP in plans, procedures, and training. In addition, he is responsible for oversight and supervision of field personnel, and ensuring compliance with this SOP.

**3.3 UXO SAFETY OFFICER**

The UXO Safety Officer (UXOSO) ensures that all mag and dig activities are conducted in a safe manner, in accordance with the approved Work Plan, the SSHP, this SOP, and all applicable regulatory guidance. The UXOSO's duties shall include, but are not limited to: analyzing UXO explosives operational risk, hazards, and safety requirements; establishing and ensuring compliance with all site-specific safety requirements for UXO and explosives operations; enforcing personnel limits and safety exclusion zones (EZ) for UXO clearance operations; and all activities associated with UXO and explosives transportation, storage, and destruction.

**3.4 UXO QUALITY CONTROL SPECIALIST**

The UXO Quality Control Specialist (UXOQCS) ensures compliance with the project Quality Control (QC) Plan and performs analog QC checks of completed grids in accordance with the Work Plan.

**4.0 OPERATIONS****4.1 ANALOG DETECTION AND REMOVAL ACTIONS**

All analog detection and removal (mag and dig) activities at MEC sites will be under the supervision of UXO qualified personnel. Non-UXO qualified personnel will not be allowed in the EZ during intrusive operations. If access is required by non-UXO qualified personnel, all work will stop while they are in the EZ. During operations, USAE personnel will strictly adhere to the SSHP and the following general safety practices:

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- Operations will be conducted during daylight hours only.
  - Access to operating areas will be limited to only those personnel necessary to accomplish the specific operation.
  - UXO will only be handled by qualified UXO Technicians.
  - During UXO operations the minimum separation distance (MSD) between UXO and non-UXO operations is fragmentation distance of the munition with the greatest fragmentation distance (MGFD), as stated in the Work Plan.
  - During demolition operations personnel remaining on site will be limited to those personnel needed to safely and efficiently prepare the item/s for destruction.).
  - All personnel will attend the daily safety briefing (tailgate safety briefing) prior to entering the operating area.
  - Anyone can stop operations for an unsafe act or situation.
  - Safety violations and/or unsafe acts will be immediately reported to the UXOSO.
  - Failure to comply with safety rules/procedures may result in termination of employment.

#### 4.2 GRID LAYOUT

A registered land surveyor will survey each of the clearance areas, accompanied by a UXO escort. Surveying activities will consist of locating clearance area boundaries, establishing permanent survey monuments, and establishing grids for geophysical investigation activities within the clearance areas.

Depending on the method selected and approved by the customer, the site layout and search grids will be established using a Global Positioning System (GPS), licensed surveyor, or compass and measuring tape. Survey crews will be escorted in the field by a UXO Technician II or above who will provide UXO avoidance including checking the intended survey stake locations with a magnetometer prior to driving stakes into the ground. This will prevent driving stakes into buried MEC.

#### 4.3 ANALOG SWEEP PROCEDURES

Intrusive investigation team(s) will consist of a Team Leader (UXO Technician III) and UXO Technicians II/I. During intrusive operations UXO Technicians I will operate under the supervision of UXO Technicians II or III. UXO operations will only be performed by qualified UXO Technicians, which are defined as:

- MEC identification
- Access procedures such as excavation, either by hand or using heavy equipment
- Handling of MEC/UXO, explosives, or explosive items
- Disposal, including movement, transportation, and final disposal of MEC

Analog detector sweeps (i.e., mag and dig) are particularly effective in areas where vegetation and terrain limit the use of larger digital systems. Also, mag and dig approaches should be used when there is insufficient difference between UXO at the site and other metallic fragments and debris, such that digital discrimination is ineffective or cost prohibitive.

Initially, individual search lanes will be established approximately 5 feet (ft) wide. Each lane will be surveyed using a Schonstedt GA-52CX and/or White's XLT magnetometer. The operation will begin at one end of each lane and move in a forward direction toward the opposing baseline. During the forward movement the technician moves the magnetometer back and forth from one side of the lane to the other. Both forward movement and the swing of the magnetometer are performed at a pace that ensures the entire lane is searched and that the instrument is able to appropriately respond to subsurface anomalies. When a subsurface anomaly or metallic surface object is encountered, the UXO Technician halts and investigates the anomaly at that time. Throughout this operation the team leader closely monitors the team's individual performance to ensure these procedures are being performed correctly.

#### **4.4 SURFACE UXO**

Upon encountering a surface MEC it will be identified by two UXO Technicians and marked in accordance with the approved Work Plan for future disposition. If detonation cannot be arranged the same day as the MEC is identified, a guard will be posted during the non-working hours to ensure the item is not disturbed.

#### **4.5 SUBSURFACE ANOMALIES**

##### **4.5.1 MANUAL EXCAVATIONS**

Subsurface anomalies will be investigated by UXO-qualified personnel as they are identified during the sweep. All identified anomalies within the grid will be intrusively investigated. Excavations for individual anomalies will be conducted using the Schonstedt GA-52CX and/or White's XLT magnetometers to assist the team in determining the location and orientation of the target item. The UXO Technicians excavating anomalies shall initially remove no more than a 6-inch layer of soil along side the location of the anomaly, being careful not to impact the anomalous feature. The UXO Technician will conduct a visual and electronic search of the excavation to further pin point the anomaly source as needed. This process shall be repeated until the audible signal from the magnetometer indicates the object is close to the surface. Once this determination has been made, soil will be removed by hand until the source of the anomaly is located. Excavations on individual anomalies greater than 4 ft below the ground surface (bgs) will not be made without prior approval of the U.S. Army Corps of Engineers (USACE) OE Safety Specialist.

##### **4.5.2 MECHANICAL HANDLING EQUIPMENT**

Mechanical Handling Equipment (MHE) may be used to excavate large anomalies (e.g., pits) or those deeper than 4 ft bgs if required (e.g., to confirm the anomaly is not a MEC). Any decision to use MHE to excavate these anomalies will be made by the SUXOS and the USACE OE Safety Specialist (see SOP OPS-06, Excavation and Trenching for detailed MHE procedures). The excavation will proceed slowly to ensure the item is not broached by the MHE. If the excavated material is considered to be a MEC, it shall be uncovered sufficiently by hand to obtain a positive identification of the item. If the item is identified as UXO/MEC, a determination will subsequently be made as to whether it is fused or not.

While excavating with MHE, a UXO Technician will be stationed in a position that is out of the reach of the excavation equipment but affords a view of the excavation site. This observer will ensure that the next lift is visually free of UXO. The excavated material will be placed onto the ground within a screening area that has been surface swept and the boundaries recorded. The soil spoils will be spread across the screening area using the excavator bucket. The excavated material will be screened for range related debris, munitions debris, and UXO/MEC items. UXO technicians will recover all pieces of munitions debris or range related debris and any ordnance items. After screening, the soil spoils will be stockpiled to the side of the screening area.

#### **5.0 RECORD KEEPING**

The team leader will maintain a field logbook, which at a minimum will contain a record of the following:

- 
- Weather
  - Instrument details and serial number
  - Team Personnel
  - Grids worked
  - Start and stop times
  - MEC/UXO items encountered

The data to be recorded for each item discovered during anomaly excavation will include the following (as applicable):

- Type (e.g., MD, MPPEH, UXO, and non-MEC Scrap)
- Description (e.g., “projo, 20-mm, practice, MK105” and “base, coupling, firing device”)
- Initial Condition (e.g., expended, inert, live, and to be determined [TBD])
- Approximate length
- Approximate width
- Depth
- Approximate weight
- Found in a pit?
- Piece of frag?
- Initial disposition (e.g., left in place and removed to scrap pile)
- Requires demolition?

All data will be turned into the Site Geophysicist at the end of the day.

## 6.0 DISPOSAL OPERATIONS

Fuzed UXO/MEC items will be blown in place (BIP), and un-fuzed UXO/MEC items will be consolidated whenever possible in accordance with USACE Engineer Pamphlet 1110-1-17, Establishing a Temporary Open Burn and Open Detonation Site for Conventional Ordnance and Explosives Projects, dated 16 July 1999, Appendix D. In no case shall the SUXOS authorize or undertake destruction of UXO/MEC when there is sufficient reason to believe that the disposal action will result in personnel casualties or property damage. The USACE OE Safety Specialist will be consulted for guidance in the event that there is sufficient reason to believe that the disposal action will result in personnel casualties or property damage.

## 7.0 REFERENCES

- USACE Safety Considerations for UXO

- USAE Corporate Safety and Health Program (CSHP)
- OSHA, 29 CFR 1910, Occupational Safety and Health Standards
- OSHA, 29 CFR 1926, Construction Standards
- Applicable sections of EPA, 40 CFR Parts 260 to 299, Protection of Environment
- Applicable sections of DOT, 49 CFR Parts 100 to 199, Transportation
- USACE EM 385-1-1, Safety and Health Requirements Manual
- USACE ER 385-1-92, Safety and Occupational Health Document Requirements for Hazardous Waste Remedial Actions
- DOD 4145.26-M, Contractors' Safety Manual for Ammunition and Explosives
- DOD 6055.9-STD, DOD Ammunition and Explosives Safety Standards
- DOD 4160.21-M, Defense Reutilization and Marketing Manual
- DA PAM 385-64, Ammunition and Explosives Safety Standards
- AR 385-64, Ammunition and Explosives Safety Standards
- AR 200-1, Environmental Protection and Enhancement
- AR 385-10, The Army Safety Program
- AR 385-16, System Safety Engineering and Management
- AR 385-40 w/USACE supplement, Accident Reporting and Records
- TM 9-1300-200, Ammunition General
- TM 9-1300-214, Military Explosives
- TM 60 Series Publications